AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

VOL. 10, No. 35 WEEKLY. | NEW YORK, AUGUST 27, 1887. | $2.50 per Annum. SINGLE COPIES, 5 CENTS.

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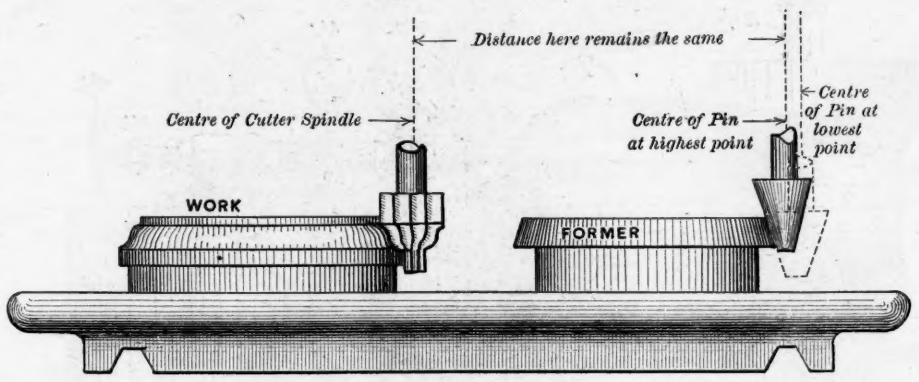
Machine for Grinding Punches and Dies.

The engraving represents a machine for grinding punches and dies, such as are used in making bolts, rivets, screws and a large variety of square or circular pieces requiring one or more finished faces. It works equally well on hard steel, chilled iron or softer metals. One of the heads carries a universal chuck for holding and revolving the pieces to be ground, and the other an emery wheel. Both of the heads run on a dove-tailed track and are fed in and out by a screw, making it so that convex, concave or flat faces can be well and quickly ground. A stop can be arranged so that the work can be ground to any desired thickness, or several pieces ground to the same thickness.

It is manufactured by the Springfield Glue and Emery Wheel Co., Springfield, Mass.



PROFILING MACHINE.

The Milling Machine—Its Construction and Uses.

BY JOHN J. GRANT.

All machines that shape work in any manner may properly be called profiling machines; therefore the above machine being the subject of this paper it is necessary to define the machines generally termed profiling or edging machines. It is a machine having one or more spindles hung in a perpendicular slide adjustable in each direction, horizontally and perpendicularly, with a table or platen for holding the work to be shaped; also a former to shape the work by, and a guide for the same, termed a former pin.

The profiling machine is well known by manufacturers of firearms and all similar classes of work, but as there are thousands of young mechanics who have never seen a machine of this class, a careful study of the following paper may be of considerable value to them in after years.

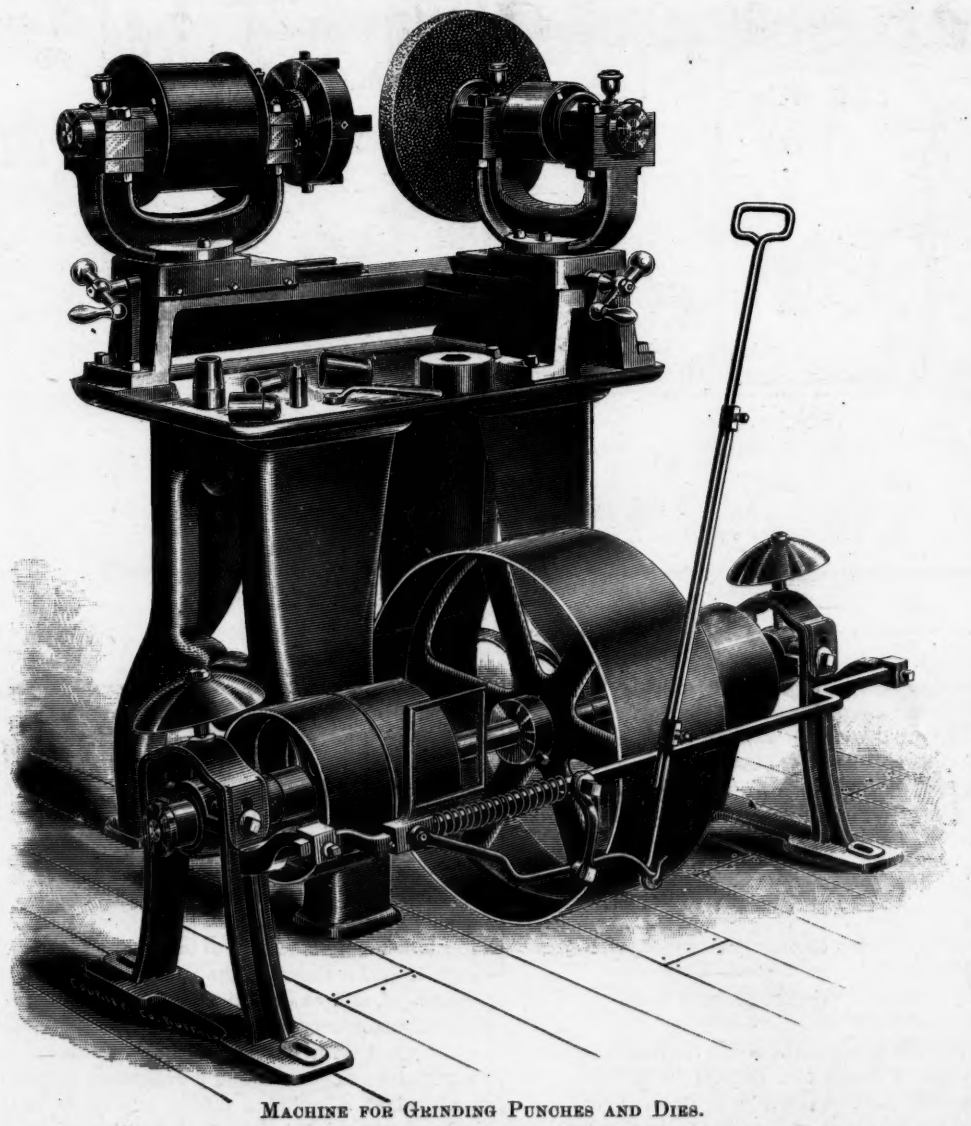
The uses of the profiling machine, like the universal milling machine, are legion; it is, however, seen to its best advantage in the manufacture of guns, pistols, and all classes of work requiring irregular shaped pieces made interchangeable. It is also invaluable in doing a variety of straight work, cutting bevel slides where both sides of the bevel can be cut at one setting, routing out "under cuts," milling the rims of balance wheels between the arms, and hundreds of other such operations.

The machine generally used has two spindles, used respectively for roughing and finishing, although they are made with one and sometimes three or four spindles. In doing work on the profiling machine, as in the bridge milling machine, it is necessary, as a general thing, to use a former; straight work, however, can be done without, by having an adjustable stop on the crosshead and bed of the machine. In profiling, the former pin is held close to the former by means of the handles working the platen and spindle head; the former pin being always the same distance from the cutter spindle, the piece of work produced must necessarily be of the same profile as the former.

In the Parkhurst profiling machine there is an auxiliary spindle used for cutting formers directly from the model. This is a valuable adjunct to the machine, as by its use it is impossible to produce a former otherwise than correct. It is necessary in machines not having this attachment to lay out and work the former to shape by hand, or the fixture and former may be reversed, and the former cut with the regular cutter spindle. This way of producing the former, although being cheaper than working them out by hand, has the disadvantage of not being as perfect, owing to any irregularities in the machine or models being multiplied.

Formers can be cut by the regular cutter spindle, using the scriber and working to lines, the scriber being placed in the former pin socket, and the model or marked templet in the usual place of the former.

The former spindle occupies the same position to one of the spindles that the former pin does to the other, and is used to hold the former pin for the spindle nearest to it.



MACHINE FOR GRINDING PUNCHES AND DIES.

The spindles and slide are made to lift above the work, to allow the work and former to pass under the roughing or finishing cutter as one or the other is not in use. At each side of the spindle slides and attached to the cross slides are adjustable stops for regulating the height of the cutters, also serving as locks to keep the spindles in position when cutting.

To make a former with the Parkhurst device the model is placed in the fixture made to hold the regular work, and the former pin and cutter transposed; that is, use the cutter in the former spindle and *vice versa*. The cutter should be of the same taper as the former pin to be used; the pin used in the cutter spindle, however, should be straight.

The former should stand about the same height as the work from the platen, and both cutter and former pin should be as short as possible, to prevent springing and chattering. Formers may be made of cast-iron, and will wear and retain their shape for a long time, but for constant use, steel is preferable. They are made about $\frac{5}{8}''$ thick and 15° taper, as shown in the engraving. The former pin is of the same taper, and by adjusting it perpendicularly, the cutter is brought nearer to or farther from the work, as will be seen by the dotted lines in the cut. This allows for the reduction in the size of the cutter by grinding.

A long experience is required to profile each and every piece to exactly the same size, as the spring of the cutter and pin, as well as loose joints in the machine, all tend to variation. It is necessary to have as little "backlash" as possible to prevent the cutter from jumping into the work.

A set of pins varying in size from $\frac{1}{8}''$ at the apex of the small one to $1\frac{1}{2}''$ at the base of the large one will be found very convenient, and if made when the machine is first set up will do away with the vexation of having to stop work in the middle of a job and make extra pins, when cutters wear too small to allow of adjustment by one size pin.

For profiling the outside of work an outside former is used, and for inside, or where a seat is made for another piece to fit into, an inside former is necessary. As in the bridge milling machine, the former pin and cutters must each be of a smaller radius than the piece to be milled. When milling common edges, a shank cutter of about $\frac{3}{4}''$ diameter is generally used, but to produce a shape other than a square edge on a piece, a cutter of the same profile as the work is necessary.

The platen of the profiling machine is prepared for the fixture and former by face milling, which is done by an end mill in one of the spindles and the entire surface dressed off, thereby insuring a perfect seat for fixture and former.

It is said that the destruction of property by fire in this country during the past six months has been four times greater than the previous average. This is moving insurance companies to investigate the cause. The companies are said to be making no money under present conditions.

Boston Model of Shipman Engine.

These engines are made for small and moderate power, using kerosene oil for fuel. The fuel and water supply are automatic, and the speed of engine is controlled by an automatic governor. In starting the fire with no steam in the boiler, the air pump, the handle of which is shown at 22, is used; by this air pressure is maintained in the boiler, this air being used with the oil. As soon as a few pounds of steam pressure is raised, then the use of the air-pump is discontinued, steam being used instead of air. The steam and oil are united in the atomizer, 12, from which they pass to the fire box. The diaphragm, shown at 15, automatically controls the fire according to the steam pressure, a spring and regulating screw providing means for any desired pressure below that at which the safety valve is adjusted to blow off. As the pressure of steam rises in the boiler to the point at which the diaphragm has been set to close, say 100 pounds, the diaphragm is gradually raised, carrying with it a valve which cuts off the passage of steam to the atomizers, and thus reduces the fuel supply. When the pressure reaches 100 pounds the valve entirely cuts off the supply of steam to the atomizers. When the pressure falls below 100 pounds the valve is released, the steam again passes through the atomizers, carrying the oil, which is again ignited by the torches burning at the side of the atomizers. The water supply is automatically controlled by means of the float shown at 27, which connects with the feed pump by means clearly represented. An exhaust steam heater, 39, heats the water before it enters the boiler.

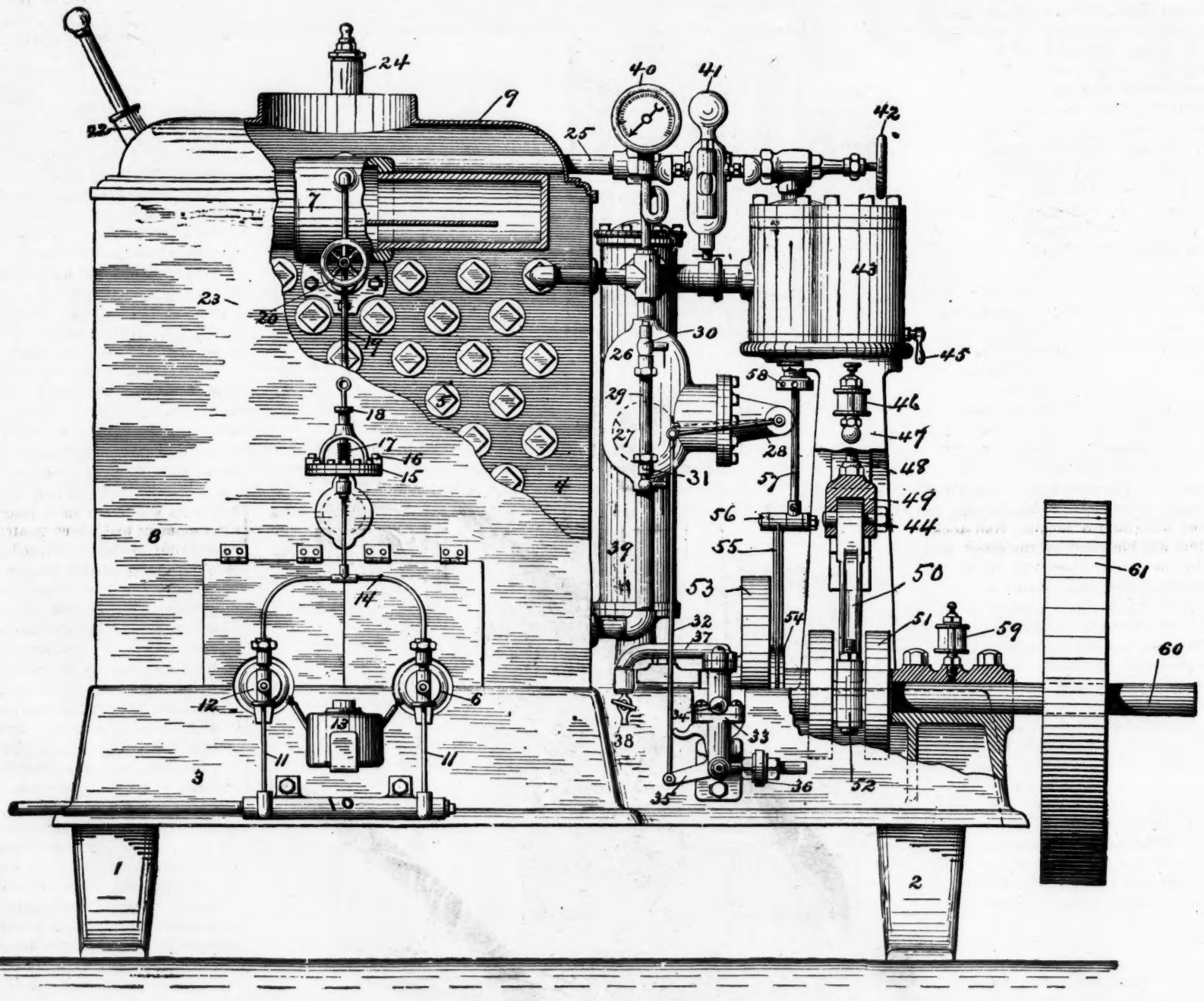
The boiler is jacketted to prevent radiation the jacket consisting of an outer and an inner shell of iron, the space between being filled with asbestos. There are two furnaces to the boiler, each fitted with flame deflector and separator. The steam dryer and separator are shown at 7; from this steam is taken to the engine, and also to the diaphragm.

A separate view of the engine is shown on page 3. From this it will be seen that the engine has the same means of adjustment that engines of large size would have, and we are assured the same care is taken in the selection of material and workmanship.

An advantage claimed for these engines is lack of dust and dirt; automatic regulation of fire, to the extent of putting it out and re-lighting it if required, and automatic water supply. It takes but a few minutes to raise steam, and if power is required only for a short time there is no waste of fuel after the engine is stopped. Every part being made by duplication, repairs are quickly furnished if required.

By slight alterations these engines are used for small yachts.

The engine shown is known as the new Boston model, and is made by the Shipman Engine Company, Boston, Mass.



The Shipman Automatic Engine.

Early Engineering Reminiscences.

By George Escol Sellers.

Thirty-third Paper.

On going to the shops the following morning I found Mr. Donkin in his office, but still far from well, yet he went with me through the shops; he took great pride in showing and explaining his great engine lathe for turning the drying cylinders. It certainly, for solidity and fine workmanship, came nearer to the lathes of the present day than anything I had previously seen in England. It was calculated to turn cylinders of 4 feet diameter, which at the time it was built was thought to be the largest that would be required, but on one occasion the heads had been raised to take in a still greater diameter, and a larger size lathe was then being constructed.

I had seen in Manchester many efforts at tools to produce uniformity in various parts of cotton spinning machinery, but nothing to compare with the tools Mr. Donkin had constructed to obtain that end in the heavier machinery for paper mills. His screw bolts were mostly lathe chased, the nuts tapped in the usual way by hand, but afterwards screwed on mandrels and lathe faced. Hexagonal nuts and heads of collar bolts were reduced to standard size and finished by milling with double cutters. As we were going through the shops, a clerk handed Mr. Donkin a letter that had been brought in haste by a special messenger; he glanced over it, asked me to excuse him for a short time, calling on the room foreman to show me around during his absence. Then I noticed that, as at Manchester, the grindstone and lap wheel were much used in finishing work, but the planing machine then being introduced was destined soon to take their place.

Mr. Donkin soon returned with the open letter in his hand, and said to me, "Here is a case in point, showing the value and importance of, as far as practicable, making all parts of machinery interchangeable. Mr. —— has met with a serious accident to his Fourdrinier machine. The carelessness of an attendant allowing a tool to slip from his hand caused a break, that before the machine could be stopped was carried forward, doing serious damage to other parts of the machine; a messenger with a conveyance and the request that I lose no time in sending workmen with tools to make repairs. He has fortunately given in his letter a full detailed description of damage done, hoping that by so doing I would, in a measure, be prepared and that he would not be obliged to have his mill shut down for more than three or four days." He then added that in the short time he had left me he had dispatched a competent workman with duplicates of all the broken parts, and that by midnight he had no doubt the machine would be in running order. He spoke of having for years made a study of the practicability of making all parts of his machines of uniform size and shape, and having the work systematically done to rule by templets and fixed gauges. The key seats in light shafting were milled, but for heavy shafting and gearing the cold chisel and file were still doing the work.

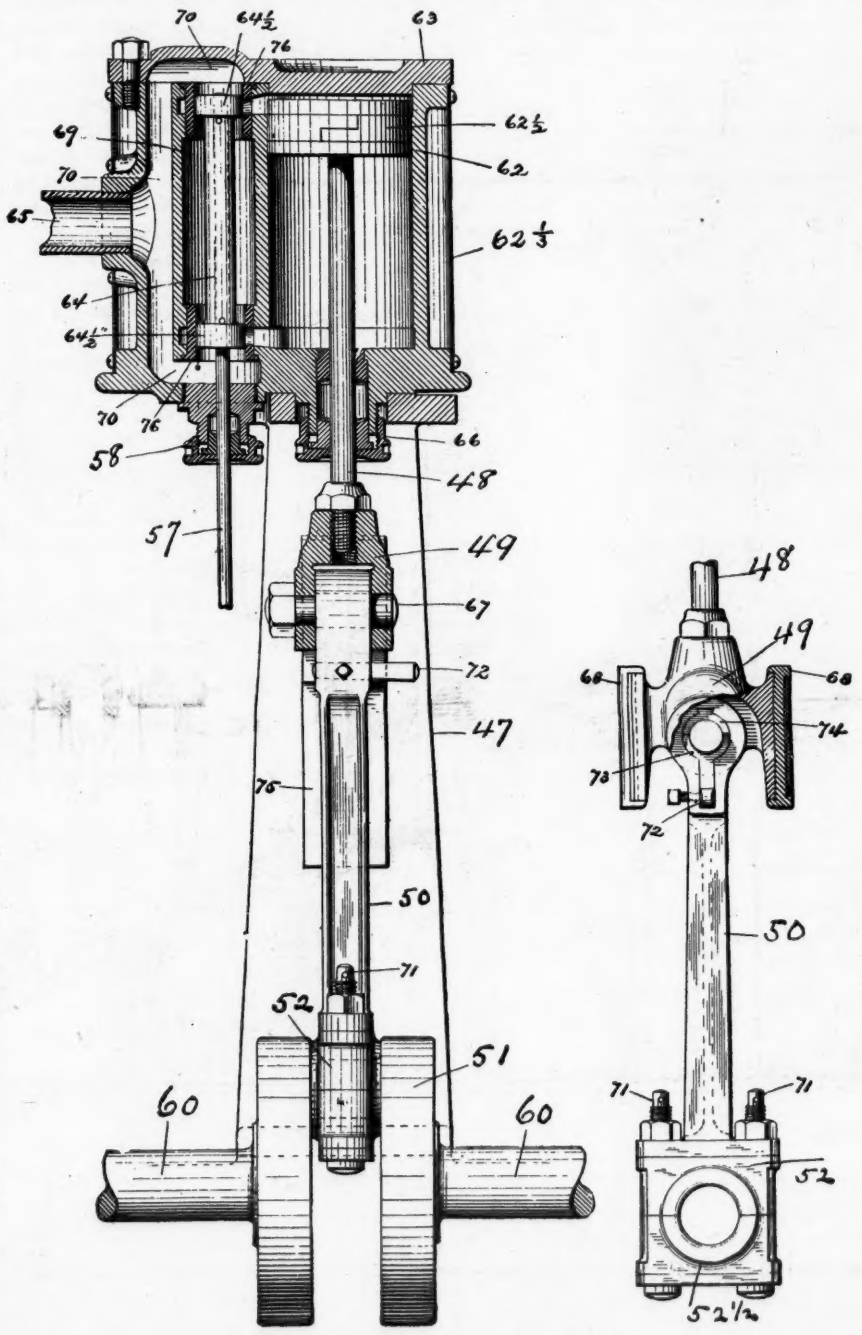
At the noon hour, when the machinery stopped, I was taken into the storeroom, in which were arranged all the various parts of the Fourdrinier machine, with the exception of the frames, press rolls and drying cylinders. It was from this room that the ready-made duplicates to replace the broken parts had been sent.

I would here note that 54 years ago this was the first instance I had seen where making the component parts of machinery interchangeable had been reduced to an absolute system, that is now so universally practiced by all first-class machinists.

From the storeroom we returned to the office, and soon Mr. Ibotsen came in, and on being introduced it was evident that he had been prepared by letter for the business in hand. He was not long in coming to Mr. Donkin's views as to the importance of securing and controlling the right of our pulp dresser, but there was an obstacle in the way; a mill in Kent was running on the fine tinted papers for the bristol boards, then

being extensively used by Dobbs, and the firm of Delarue & Co. for their beautifully embossed boards or cards, which at that time was the fashion's rage. These delicately tinted papers were entirely free from knots and imperfections, and Mr. Ibotsen had learned that the proprietor of the mill claimed to have invented and had in use a pulp screen or dresser greatly superior and less costly than his. If this was the case there would be no use in securing further rights. He had been trying to learn the nature of the invention, but so far unsuccessfully, but what little he had learned had inclined him to believe it was an infringement on his patent working secretly to avoid payment for the right. Dr. Donkin concurred in this view. He had built the Fourdrinier and other machinery for the mill, and had recently sent workmen to make some changes in gearing, who had not been permitted to go into the machine room. The owner of the mill was not remarkable for courtesy or refinement, and at other times was rather crusty, and still Mr. Donkin thought if I would be willing to go to the mill with a letter of introduction from Mr. Delarue, who was the principal consumer of his paper, stating that I was an American traveler curious to see the manufactories of the country, that I had seen their embossing presses at work (I had been introduced to both Dobbs and Delarue by W. H. Burgess, then the landscape painter to the king, and I had found them most courteous gentlemen who had freely shown me their presses in operation) Mr. Donkin thought with such a letter I would be treated with civility and probably be shown through the mill. In that case a mere passing glance would be sufficient to tell whether the pulp dresser was an infringement on Ibotsen or not. If I would consent to go Mr. Donkin would procure the letter from Mr. Delarue; there could be no harm in that, but I must consider the matter. I accompanied Mr. Ibotsen home, arriving there after dark. During the evening, as the mill was running day and night, he proposed going through it to see some of his improvements. Half stock at that time was bleached by the direct action of chlorine gas in chambers or chests in which Mr. Ibotsen had made some arrangements of the slat shelves on which the half stock was placed to facilitate the handling, and to keep it so separated as to insure the equalization of the gas on all portions. By his arrangement he had shortened time required, saved gas and consequently expense. These chambers were arranged on both sides of a railway passage, and as we were walking through, he told his manager to open the chamber that the gas had been longest cut off from, to show the condition of the stock and the inner construction of the chamber. The manager pointed out a chamber, but at the same time cautioned against opening it before morning, or at any rate to give it two or three more hours; but Mr. Ibotsen raised the latch and as the sliding door fell, the heavy gas-like water poured on us. I was suffering the latter stage of full catarrh now known as hay fever, and the effect of inhaling the chlorine gas was so suffocating that it came near ending me. I was carried into the open air and pretty roughly handled to restore respiration. The dose was a heavy one, and both Mr. Ibotsen and the manager suffered from it. The next morning the latter told me he had walked his room all night sipping new milk, his sovereign remedy. I then learned that to prevent such accidents on opening the chests, in cases that the gas had not been entirely expended or neutralized in the bleaching process, a trough opening into the outer air with gates or valves was provided for each chest, and these were usually opened some time before dropping the doors to discharge the stock from the chests. This unfortunately had not been done, and we suffered in consequence. Mr. Ibotsen proposed connecting all these openings with a box trough and exhaust pan; I suggested instead, carrying the box trough at an acute angle into the water of the tail race, with its lower end cut to the angle at which it entered the water that I believed the suction of the rushing water, aided by the strong affinity of chlorine for the hydrogen of the water, would rapidly exhaust any chamber opened to it. I had the satisfaction long after of learning that this had been successfully adopted.

On returning to London I found the letter from Mr. Delarue, and I took the evening stage coach for Maidstone, Kent. The following morning proving pleasant, I walked out to the mill to deliver my letter and try my luck. The external appearance of the mill was rather forbidding; the windows of the main mill were small and high from the ground; the mill yard had one side protected by the mill, the other three by a high brick wall. The only entrance to it was by a high arched gateway, with a small door in one of the folds. The extrance to the mill was through an entry passing the office, with windows and glass doors so arranged that no one could



The Shipman Engine.—See Page 2.

pass in or out without being seen. The mill race flanked one side of the mill, passing the long one-story building in the rear, which the steam from its ventilators showed to be the machine room. This moat-like mill race—small windows and high yard wall—gave the appearance of a fortified place, or jail. It was hard to realize it was a paper mill, so unlike our light, airy mills. In front of the mill was hitched a horse, attached to a rather dilapidated gig; in the door-way stood a man who might be a stable boy watching the horse, or a sentinel guarding the entrance. Of this man I inquired where I could find the master. With his thumb over his shoulder he pointed towards the office. In an outer one were two clerks; one of them, in reply to a similar inquiry, answered as the man at the door had, by a thumb pointed to a kind of inner office or box. I began to feel as if I was in a deaf and dumb asylum, but this feeling did not last long. The master sat at a desk that appeared to be covered with a confused mass of papers. He was a short, thick-set, shock-headed man, with a face disproportionately large for his head. As he turned from his desk, he evidently took my dimensions from head to foot. There was that kind of forced smile on his face that seemed to ask: "Have you come to order paper?" but not a word spoken. I handed him my letter of introduction, which he opened, holding it in his left hand, alternately reading a few words and scanning me. As he read on his brows contracted, his flabby cheeks became taut, the muscles at the corners of his mouth twitched; his shock-head rocked from side to side, his right arm jerked with a kind of pawing motion, calling forcibly to mind a bull lashing himself into a dangerous rage. Suddenly with a blow of the fist of his right hand, he crushed the letter into the palm of his left, and burst forth: "What does Delarue mean by writing this to me, if he did write it? He knows as well as any man that I never admit strangers to my mill. I've told him so a hundred times, and now to send here and expect me to show my mill to (something that sounded like) a d——d Yankee." In spite of disappointment, the disposition to laugh outright at the impotent passion the man had lashed himself into was almost irrepressible. I stood a moment in hopes the froth and scum would boil over, but, seeing no indication, I said that if I had been made aware of his rules and regulations I should not have intruded; that I had visited many manufactories, and heretofore had met with courtesy. I then added that on the way to his mill I had noticed crowds of people in hop fields, which was something new to me, and if I could venture, without danger of being expelled or arrested for trespass, I should like to learn something of the management of a hop crop. He said, "You can go where you like, so it is outside of this mill, and the sooner you are off the better." On this, as we say here in the West, I sloped. As I walked into the nearest hop field I tried to make excuses for the man's rudeness and insolence, it being the first case of the kind I had met with in England. I had learned that the man had worked up from a hand in a paper mill to become a proprietor of a mill, mainly through his skill in making with uniformity the beautiful neutral tinted papers then the rage for the kind of work turned out by Dobbs and the Delarues. I had understood that this portion of the work was always done by himself, not communicating his secrets to any one of his employees; this would account for his exclusiveness—the dread of interlopers—but was no excuse for his insolence.

Looking back towards the mill, I saw him get into the gig, and drive off towards Maidstone, venting his passion through his whip on his horse, that he was urging on at a furious rate. The question with myself was how far I would be justified in surreptitiously obtaining the information I was in search of. By my understanding with Mr. Ibotsen, if I found the pulp dresser was anything likely to supplant his and my father's, nothing further was to be done; but if Crusty's (as I must now call him) was an infringement on Ibotsen that could legally be enjoined and damages recovered, then our trade was to be consummated. By it, Ibotsen was to pay all expenses of securing a patent, as introducer, or to suppress my father's, at his option, to pay £200—£50 cash, the remainder in royalties as the machines were introduced, whether under the Ibotsen patent or my father's plan. I felt that by spending a few days at Maidstone I could make the acquaintance of some of the operatives in the machine room, and by a little money in a social way get at the secret of the pulp dresser. Such a thought would not have been entertained for a moment had I been treated with common civility in being refused admittance. While studying on this, I again chanced to look towards the mill, and saw a plank thrown from a window of the machine room across the mill race, and a man, with the conventional paper-maker's square cap on his head, cross on the plank, and quickly run to a cottage near by. I hurried to intercept him as he would return, and was just in time to meet him as he came out of the cottage. Pointing to the mill, I asked him if he could tell me what that building was. "A paper mill." I then asked, "Do they make the long paper in sheets, as they do in America?" "Do you be an American?" "Yes." "Did you ever happen to see John Hanlon? He is a paper maker, and he says in his letter that he works for Mr. Robinson, near Philadelphia." "No, I have never met him; but I know Mr. Robinson." I said I had often seen them making sheets of paper in his mill. I took out my memorandum book, asked the man his name, and offered to carry any message to his friend Hanlon, through Mr. Robinson, whom I should certainly see on my return to America. This opened the flood-gates, and had there been time, and I inclined to listen, I should have had a whole family genealogy, as well as that of the Hanlons, and how the man was saving every penny he could, and what he had laid by to take him and family to America. When I got a chance to get in a word, I asked if he could tell me how long paper was made, and how the sheets were united so we could not discover the joints. "Why, bless you! they don't make sheets on paper moulds at all; it is just a long wire web, sewed together at the ends; and it goes over rollers right along, and the stuff runs onto it, and it shakes both ways, just like the mould; and it goes along, and the pulp is pressed on the felt by rollers; and so on it goes to the steam drying cylinders, and comes out paper—dry paper." "How very curious! I should like so much to see it." He said, "I would like to show it to you; and then you could tell

John you had seen the machine I am boss of. But it would be all my place is worth, if the master found me out. He won't let anybody see anything in his mill He is afraid they will steal his secrets. And to-day he is on the rampage; he has been cursing me, just because the color of the paper is a shade lighter than he intended, and I said it was not in the color he had put in, but in the new bleach he was trying; and the master don't like anyone to know anything but himself." We were by this time at the plank over the race, and I noticed how nervously the man was watching the turns of the Maidstone road; and I must confess to doing so myself.

I thanked him for the information he had given as to how long paper was made. I handed him a half dollar, telling him it was an American coin, given as a remembrancer of the American, who would certainly tell Hanlon that his friend was saving up to go to America. I then asked him if he had time to begin at the beginning and again tell me how the long paper was made; that I had been greatly interested in what he had told me, and I should like to know if they sifted the rags after they were ground, like flour was sifted in the corn mills? Instead of answering, he asked if I could walk that plank—it was not strong enough to carry two, or he could steady me. He had three men and four girls in his room. There was no danger of their telling on him, for he was their boss, and they all hated the master like poison; but I could not stop over a minute or two, as the master might come back sooner than usual. He tripped over the plank, and I followed, feeling almost as guilty as if committing a burglary. We walked by the dryers and machine to the vat where the pulp dresser was working. The man, paper maker like, took up a handful of the dilute pulp, squeezed the water out of it, and handed it to me. I did the same, taking care that it was from the knot receptacle, for future examination.

Having seen all I wanted, I was in haste to get out, hurried on a short cut through a hop field, and came out through a hedge-gate on to the public road about a quarter of a mile from the mill, just as Crusty passed on his return.

The pulp dresser was a decided infringement on Ibotsen's patent, differing in being circular with annular slits, instead of rectangular with bars and straight slits. The screening was done by the same up and down jogging motion precisely by the same means as Ibotsen's; but it had in addition what was injurious instead of beneficial—an automatically revolving wiper to clean the surface of the screen and carry the knots into a receptacle, from which they were taken back to the beating engine to be reground. This constant brushing made rolls of pulp and pressed fibers into the slits, clogging the screen and requiring more frequent cleaning than the Ibotsen.

I returned to London the same evening. Mr. Dorkin was much amused at my description of my interview with Crusty, and gratified at the result of the venture. The arrangement that had mainly been made by his intervention with Ibotsen was carried out. After my return home I learned that the information gained, and the sketch I made showing the infringement, had enabled such a presentation to be made that legal proceedings were avoided by Mr. Donkin replacing the machine I had seen with an Ibotsen.

During about a week that I remained in London, I had several very pleasant interviews with Mr. Donkin, all strengthening the opinion I have previously expressed, that he was the most advanced mechanical engineer of the time, and it is to his inventive ability, zeal and persistent application through a period of over 30 years, that the world is indebted for the perfecting of the crude ideas of Robert and Didot, and producing the self-acting endless web paper machine in such perfection by the year 1832, that in the 54 subsequent years no essential changes have been made, and now the great bulk of the paper of the world is produced on machines substantially as they came from his brain and hands at that early period.

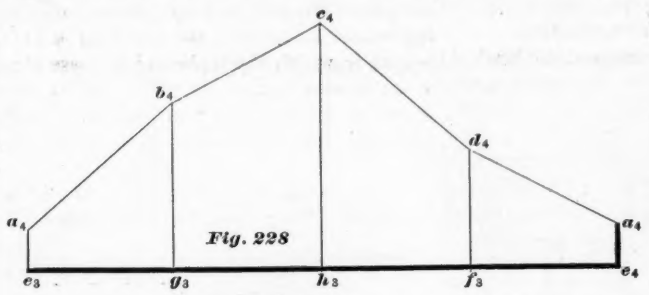
Practical Drawing.

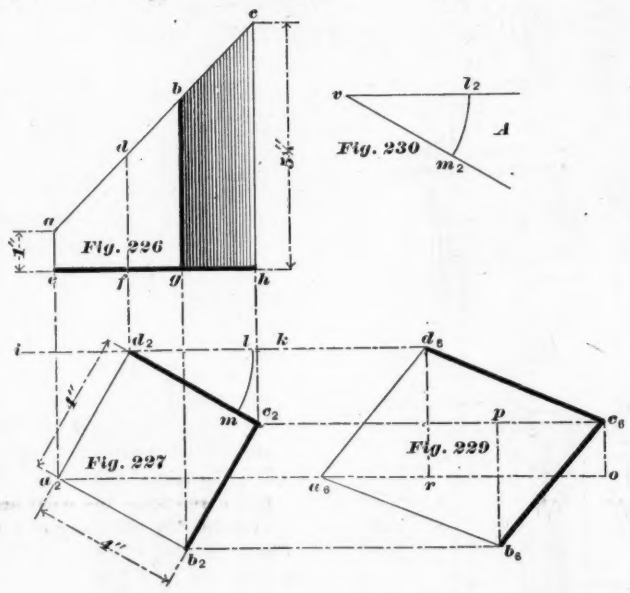
By J. G. A. Meyer.

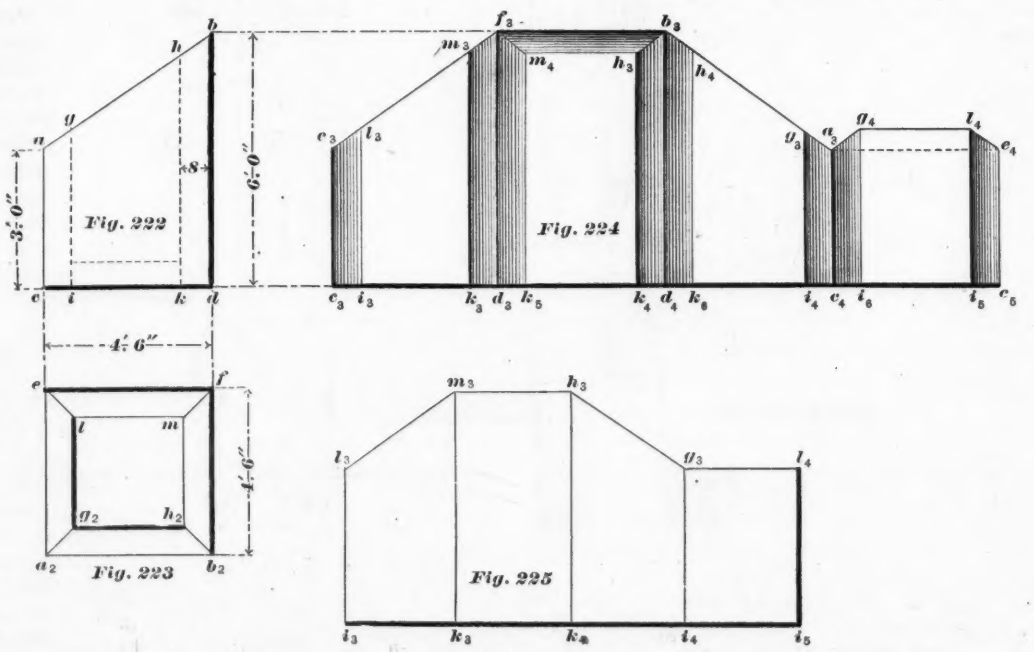
THIRTY-FIRST PAPER.

Problem 38.

316. Practical application of Problem 37. Let Fig. 222 represent a vertical projection (or elevation) and Fig. 223 a horizontal projection (or plan) of a square box whose dimensions are given in the figures: it is required to develop its outer and inner surfaces as shown in Fig. 224, or practically it is required to unfold the sides of the box.







The length of a side of the outer square in Fig. 223, as $a_2\ b_2$ or $a_2\ e$ will represent the width of the outer surface; the length of a side of the inner square, as $g_2\ h_2$ or $g_2\ l$ will represent the width of the inner surfaces. The lengths of the lines $a\ c$, $b\ d$, Fig. 222, will represent the height of the outer surfaces, and the dotted lines $g\ i$ and $h\ k$ will represent the height of the inner surface.

Let us assume that the development or unfolding is to commence at the edge represented by the point e in Fig 223, and by the line representing the edge coinciding with the line $a\ c$, Fig. 222.

In unfolding the sides of this box we first find the development of its outer surfaces.

Now, according to the given dimensions, the outside of the box is 4 feet 6 inches square, and consequently the length of the development of the outer surface from c_3 to c_5, Fig. 224, must be equal to four times the width of the outer surface of one side of the box. Therefore, draw a horizontal line $c_3\ c_5$, Fig. 224, and make the length from c_3 to c_5 equal to $4\times4'\ 6'' = 18$ feet. Divide the line $c_3\ c_5$ into four equal parts; through the points of division $d_3\ d_4\ c_4$, also through the ends c_3 and c_5, draw lines perpendicular to the line $c_3\ c_5$. Make the lengths of the lines $c_3\ e_3$, $c_4\ a_3$ and $c_5\ e_4$ equal to the length of the line $a\ c$, Fig. 222; also make the lengths of the lines $d_3\ f_3$ and $d_4\ b_3$, in Fig. 224, equal to the length of the line $d\ b$, Fig. 222. Join the points $e_3\ f_3\ b_3\ a_3$ and e_4 by straight lines as shown, then the surface bounded by these lines, and also the lines $e_3\ c_3$, $e_4\ c_5$, $c_3\ c_5$, will be the development of the outer surface of the sides of the box. So far the construction is similar to that shown in Fig. 191, and the reasoning given in Prob. 37 is also applicable in this case.

In a similar manner the development of the inner surface of the box as shown in Fig. 225 is obtained. But it should be remembered that, since the width of each inner surface is equal to 3 feet 2 inches, it follows that the distance between the points i_3 and k_3 or k_3 and k_4 etc., must be equal to 3 feet 2 inches; making the length of the line $i_3\ i_5$ equal to 12 feet 8 inches. The lengths of the lines $i_3\ l_3$, $i_4\ g_3$, $i_5\ l_4$ must be equal to the length of the dotted lines $i\ g$ (Fig. 222) and the lengths of the lines $k_3\ m_3$, $k_4\ h_3$ must be equal to that of the dotted line $k\ h$, Fig. 222. But in unfolding the side of the box we see the outline of the outer surfaces, and also the inner surfaces of the sides; therefore in order to show correctly the appearance of the sides of the box when they are unfolded we must combine the development of the outer and inner surfaces in one view. Since both the outer and inner surfaces are terminated at the lower end of the box by one horizontal plane, it follows that in the unfolding of the sides, Fig. 224, these surfaces must also be terminated at the bottom by one straight line $c_3\ c_5$. Hence, to combine the outer and inner surface in one view, we proceed as follows:

From the point c_3 (Fig. 224) on the line $c_3\ c_5$ lay off a point i_3, the distance between these points must be equal to the thickness of the sides, namely, 8 inches, also 8 inches from the point d_3 lay off on the line $c_3\ c_5$ a point k_3; through the points i_3 and k_3 draw the vertical lines $i_3\ l_3$ and $k_3\ m_3$, terminating in the line $e_3\ f_3$, then will the surface $i_3\ k_3\ l_3\ m_3$ be equal to $i_3\ k_3\ l_3\ m_3$, in Fig. 225. In a similar manner the surface $k_4\ i_4\ h_4\ g_3$, Fig. 224, is drawn in position. On the line $c_3\ c_5$ lay off a point k_5 eight inches from d_3; also on the same line lay off a point k_4 eight inches from d_4; through the points k_5 and k_4 draw the vertical lines $k_5\ m_4$ and $k_4\ h_3$, and make the lengths of these lines measured from the line $c_3\ c_5$ equal to that of $k\ h$ in Fig. 222. Join the points m_4 and h_3 by a straight line; also join the points f_3 and m_4, b_3 and h_3 by straight lines. The rectangular surface $m_4\ h_3\ k_5\ k_4$ will be equal to, and represent the same surface as $m_3\ h_3\ k_3\ k_4$, in Fig. 225. In a similar manner draw the rectangular surface $g_4\ i_6\ l_4\ i_5$, the height of this surface, that is from i_6 on the line $c_3\ c_5$ to g_4 must of course be equal to the height $i\ g$ in Fig. 222. The surface $g_4\ i_6\ l_4\ i_5$, Fig. 224, will then be equal to $g_3\ i_4\ l_4\ i_5$, Fig. 225, and will complete the representation of the sides of the box as they will appear when they are unfolded. The lines $f_3\ m_4$, $b_3\ h_3$, $a_3\ g_4$ and $e_4\ l_4$ represent the lines or joints $f\ m$, $b_2\ h_2$, $a_2\ g_2$ and $e\ l$, Fig. 223. Practically speaking, Fig. 224 represents the development of a surface in which the thickness of the surface has been taken into account.

Directions.—In the space marked Prob. 38, draw to a scale of $\frac{1}{4}$ of an inch to a foot the two views of a box having the dimensions given in the illustration. Then show the appearance of the sides of the box, when these have been unfolded, as represented in Fig. 224. The development of the inner surface (Fig. 225) need not be shown. Our object in giving Fig. 225 was simply to make our explanation as plain as possible.

Problem 39.

317. It is required to project or make a drawing of a truncated prism of given dimensions. The face or side $d_2\ c_2$ (Fig. 227) of the prism must make an angle with the vertical plane of projection, equal to the given angle A, Fig. 230. Its lower base is square and parallel to the horizontal plane of projection. Its upper surface $a\ c$, Fig. 226, is a plane, perpendicular to the vertical plane of projection, and oblique to the horizontal plane of projection, as shown. It is also required to develop the bounding surfaces of this truncated prism.

In this case we must first obtain the horizontal projection.

Fig. 227. Draw any horizontal line, $i\ k$. From any point d_2 on this line as a center, and with any radius, draw an arc, $l\ m$. From the vertex v of the given angle (Fig. 230) as a center, and with the same radius, draw an arc $l_2\ m_2$, terminating in the sides of the angle at the points l_2 and m_2. Make the arc $l\ m$ (Fig. 227) equal to the $l_2\ m_2$; and through the points d_2 and m draw a straight line, $d_2\ c_2$, then will the angle $l\ d_2\ c_2$ be equal to the given angle A. (See Art. 111.)

Since the base of the prism is to be four inches square, lay off on the line $d_2\ c_2$ a point c_2; the distance from the point d_2 to the point c_2 must be equal to four inches. Through the point d_2 draw a line $d_2\ a_2$, perpendicular to the line $d_2\ c_2$. To do this, use the T and set square in a manner similar to that shown in Fig. 71, and explained

in article 107. On the line $d_2\ a_2$ lay off a point a_3; the distance between the points d_2 and a_2 must be equal to four inches. Through the point a_2 draw a line parallel to $d_2\ c_2$; also through the point c_2 draw a line parallel to $d_2\ a_2$, and cutting the line $a_3\ b_3$ at the point b_3, thus completing the square $a_2\ b_3\ c_2\ d_2$, which will be the horizontal projection of the truncated prism. In drawing the lines $a_2\ b_3$ and $b_3\ c_2$ parallel to the other two sides of the square, use the T and set square in a manner similar to tha shown in Fig. 80, and explained in Art. 113, draftsmen's method.

Fig. 226. To obtain the vertical projection. At any convenient distance above the point d_2 (Fig. 227) draw a horizontal line $e\ h$; in drawing this line use the T square as shown in Fig. 47, and explained in Art. 79. Through the points a_2, b_2, c_2, and d_2, draw vertical lines, or, in other words, draw lines perpendicular to the line $e\ h$, and let these vertical lines extend considerably above the line $e\ h$, and intersecting the same line at the points e, f, g and h. According to the given dimensions the height of the edge $e\ a$ must be 1 inch; hence, on the line $e\ a$ lay off a point a at a distance of 1 inch from e; the height of the edge $h\ e$ must be $5\frac{1}{4}$ inches, therefore, lay off on the line $h\ e$ a point c at a distance of $5\frac{1}{4}$ inches from h. Join the points a and c by a straight line, which will complete the vertical projection. The line $a\ c$ represents the upper surface of the truncated prism, and since this surface is represented by one line, it must be a surface which is perpendicular to the vertical plane of projection. This surface also limits the length of the lines $d\ f$ and $b\ g$, which represent the other two of the four lateral edges of the prism.

318. DEVELOPMENT OF THE LATERAL FACES OF THE TRUNCATED PRISM. FIG. 228.

Draw the horizontal line $e_{\overline{3}}\ e_4$. Now, since the width of a lateral face or side is equal to 4 inches, and since there are four faces, it follows that the length of the $c_{\overline{3}}\ c_4$ must be made equal to 16 inches. Divide the line $c_{\overline{3}}\ c_4$ into four equal parts, and through the points of division $g_{\overline{3}}$, $h_{\overline{3}}$, $f_{\overline{3}}$, and also through the points $l_{\overline{3}}$ and e_4 draw lines perpendicular to the line $c_3\ c_4$. Let us assume that the development or unfolding is to commence at the edge represented by the point a_2 in Fig. 227, and the line $a\ e$ in Fig. 226. Make the length of the perpendicular line $e_{\overline{3}}\ a_4$, Fig. 228, equal to $a\ e$, Fig. 226; $g_{\overline{3}}\ b_4$ equal to $g\ b$, $h_{\overline{3}}\ c_4$ equal to $h\ c$, $f_{\overline{3}}\ d_4$ equal to $f\ d$, and $e_4\ a_4$ equal to $e\ a$. Join the points a_4, b_4, c_4, d_4 and a_4 by straight lines; then the surface bounded by these lines, and the lines $e_{\overline{3}}\ e_4$, $e_{\overline{3}}\ a_4$, $e_4\ a_4$ will be the development of the lateral faces of the truncated prism.

319. To find the true form of the upper surface $a\ c$, in Fig. 226. Through the points $a_2\ b_2\ c_2\ d_2$, Fig. 227, draw horizontal lines of indefinite lengths towards the right. On the line $a_2\ o$ choose a point a_6 at a convenient distance from the horizontal projection; from the point a_6 on the line $a_2\ o$ lay off a point o, the distance between the points a_6 and o must be equal to the length of the line $a\ c$ (Fig. 226). Through the point o draw a line perpendicular to $a_6\ o$, and cutting the line $c_2\ c_6$ at the point c_6; on the line $c_2\ c_6$ lay off towards c_2 a point p; the distance between the points c_6 and p must be equal to distance between the points c and b (Fig. 226) measured on the line $a\ c$; through the point p draw a line perpendicular to the line $c_2\ c_6$, and cutting the line $b_2\ b_6$ at the point b_6. From the point a_6 lay off on the line $a_6\ o$ towards o a point r; the distance between the points a_6 and r must be equal to the distance between the points a and d measured on the line $a\ c$ (Fig. 226); through the point r draw a line perpendicular to the line $a_6\ o$, and cutting the line $d_2\ d_6$ at the point d_6. Join the points a_6 and d_6, d_6 and c_6, c_6 and b_6, a_6 and b_6 by straight lines; these lines will be the bounding lines of the upper surface, or, in other words, the parallelogram $a_6\ b_6\ c_6\ d_6$. Fig. 229, will represent the true form of the upper surface, which is also represented by the line $a\ c$ in Fig. 226.

The principles connected with this construction will be given in our next paper.

Directions.—In the upper right hand corner of the space marked Prob. 39 draw any angle, as shown in Fig. 230, and assume this angle to be the given angle. Then draw in the same space to a three inch scale, the horizontal and vertical projection of a truncated prism having the same dimensions as given by the figures in the illustration; also work out the developments, as shown in Figs. 228 and 229, and place these views in about the same order as shown.

P. R. R. Repair Shops at Altoona, Pa.

In passing through the P. R. R. repair shops at Altoona, Pa., the cleanliness of the shops, and the order kept, cannot fail to attract at once the visitor's attention.

The arrangement of tools, and the kind of tools, is such as will enable the management to turn out excellent engines, in a comparatively short time. The amount of work done last year will, we believe, sustain the assertion. Last year one hundred and twenty-four new engines were built in these shops. Among these engines were twenty-two soft-coal burning passenger engines, fourteen large switching engines, sixteen hard-coal burning passenger engines, six small switching engines, fifty-three class R engines (large consolidation engines) and five soft-coal burning freight engines. Besides these new locomotives, three hundred and eighty-two engines underwent general repairs, and one hundred and sixteen engines lighter repairs. In addition to the locomotive work, a great amount of work has been done to maintain the roadway. To do this amount of work, and at the same time the good quality of work for which the P. R. R. is noted, reflects credit upon its management.

Mertillon R. Clapp, mechanical engineer of the Clapp & Jones Manufacturing Company, died at Hudson, N. Y., on Thursday night, of Bright's disease, aged 60 years. Mr. Clapp was the inventor of the steam fire engine bearing the name of his company, as well as much valuable machinery, especially in steam boilers and pumping engines. He was well known all over the United States, not only for his superior mechanical ability, but for his uniform courtesy, which gained him many friends.

Hangers for Truck Centers.

When swing centers are used for locomotive trucks, it is the usual practice to suspend these swing centers by four wrought-iron hangers, two at each end, as shown at $a\ a$, Fig. 4. These hangers generally swing on a bolt b, passing through both transverse bars $d\ d$; the lower end of these hangers sometimes work on one bolt passing through the center casting C, and in some trucks they work on separate pins screwed to the center casting. The distance between the transverse bars $d\ d$ is often limited, and, therefore, the width of the hangers $a\ a$ must be made too narrow to give a sufficient bearing surface on the pin or pins, and, consequently, the pins will wear very quickly, causing the locomotive to be kept out of active service until these pins are replaced. Frequently the design of trucks is such in which the replacing of these pins is not an easy matter, as trouble is experienced to remove the worn-out pins, and considerable time is required to fit the new ones.

To overcome these difficulties, Mr. John Johnston, of the Erie Railroad shops, at Jersey City, N. J., has invented and perfected a very simple design by which the hangers $a\ a$, Fig. 4, are replaced by one very wide hanger e, as shown in Fig. 5; an end view of the same hangers is shown in Fig. 6. As will be seen, the upper end of this hanger swings on one pin f, passing through both transverse bars $d\ d$. The lower end of the hanger e takes hold directly of the end of the swing center casting C without using any pin. The hanger e is made as wide as the space between the transverse bars $d\ d$, or the design of the truck will admit, thus obtaining a very large bearing surface on the pin f, reducing the wear and avoiding the necessity of laying up the engine at short intervals for repairs, as must be done when hangers like those shown in Fig. 4 are used.

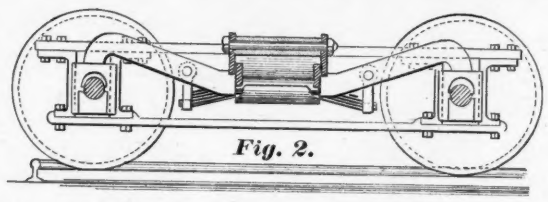


Fig. 2.

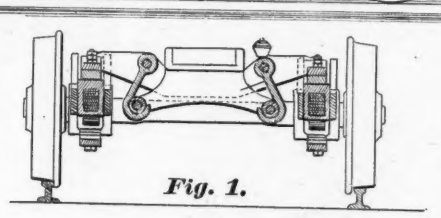


Fig. 1.

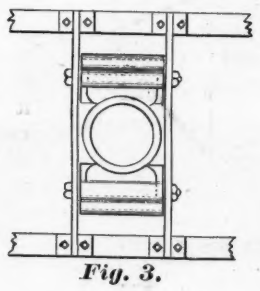


Fig. 3.

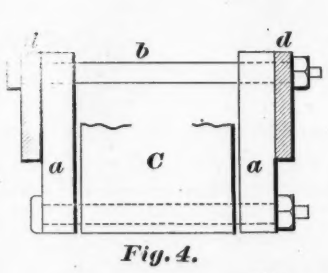


Fig. 4.

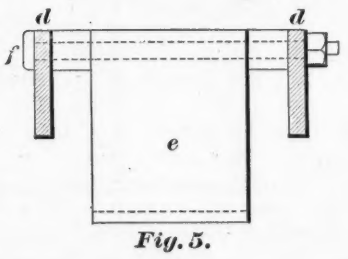


Fig. 5.

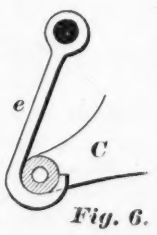


Fig. 6.

HANGERS FOR TRUCK CENTERS.

Fig. 1 represents a transverse section. Fig. 2 a longitudinal section of the truck, and Fig. 3 a plan of the center casting with the new hangers attached. It will be seen by these illustrations that only two pins are used for suspending the center casting, whereas if suspended as shown in Fig. 4, at least four pins must be used; sometimes six and occasionally eight pins are used to accomplish the same purpose. The new design of hangers can be attached in most cases without making any change in the design of the truck.

A Rare Example of Honor.

The following, which we take from the Jersey City *Evening Journal*, is worthy of being passed along. Any comments on the bare facts as given would be worse than superfluous:

The wall paper manufacturing firm of Janeway & Co., at New Brunswick, has lately given an unusual evidence of financial integrity. The firm failed some years ago and compromised at sixty cents on the dollar. When it renewed business and got on a firm footing again it began paying to its creditors installments on the remaining forty cents, although it could not be obliged to do so, and it has now paid the last dividend, including interest at six per cent. for all the years since the debts were contracted. Three years ago the firm's factory was burned down, and it found it necessary when it was rebuilt and started again to cut down the expenses. The firm, in order that its employes might not suffer, employed its men clearing away the ruins. It disliked to reduce wages, but it was obliged to do so. Now, however, the wages have been placed at the old scale again, and the employes are receiving checks for amounts covering what they would have received but for the reduction. Long live the Janeways.

LETTERS FROM PRACTICAL MEN.

Conventional Section Lines.

Editor American Machinist:

Some time ago I noticed the publication in your columns of a series of conventional section lines, by Mr. Van Vleck, of Cornell University, and I now see that Mr. Meyer has adopted it in his articles on mechanical drawing. I want to enter my most vigorous protest against all schemes of this kind.

My indictment against them is that they consume time and money, that they render drawings obscure instead of plain, that they are the cause of continual vexation of spirit, and that they serve no good purpose whatever—in short, that they are the result of misdirected ingenuity, and have no excuse for existence.

I once spent considerable time collecting schemes of this kind, and in comparing, sorting, and adjusting them for my own use, but one day I had an inspiration, and in consequence—figuratively speaking—kicked the whole business into the street. Now I section all drawings in full black lines, and designate materials by lettering over each piece the name of its material—steel, brass, wrought-iron, or whatever the case requires.

I have seen many of these schemes of conventional lines, but never one complete enough to cover all the materials used by the engineers; and yet, paradoxically, the more complete they are made the more burdensome and objectionable they become. It goes without saying that they consume time. Sections in dotted and other complex lines require more time to make than those in plain full lines and letters. Moreover, the system requires many pieces to be made in section, in order to show the material, which otherwise would be in simple outline. Using these lines, too, it becomes almost impossible to provide for those inevitable changes of material which come with time and experience, and quite so to keep a record of both old and new without making entire new drawings. With the letters it is a trifling matter to accomplish both. Every new draftsman that comes into an office where the conventional section method is used, must learn the scheme as he would a new language. His head is already full of the fragments of a dozen other such schemes, and hence frequent mistakes. Further, if the scheme is to serve its intended purpose (tell the workman what materials to use) every workman in the shop must learn it, and all with what final result? Drawings that, outside the place where they were made, are unintelligible, and at home are prolix and obscure, when the English language would have made them plain and clear to all men. In point of fact, however, the workmen never do learn these schemes, and to the draftsmen they are a constant burden. To interpret the drawings a key becomes necessary. This key is in effect a dictionary, and it would be as reasonable to name materials in French or German, and send the workmen to a dictionary for the meaning of the words, as to name them by conventional lines and send them to the key for the meaning of the lines. The case is worse yet when drawings are made to go to another shop, where, in all probability, some other set of lines is used. Then the trouble and confusion caused are enough to consign the whole thing to perdition. The case is best summed up by a characteristic expression of Prof. Sweet's, "A bad case of left-handed economy."

The argument in a nutshell is this: Using words, the drawings involve no unnecessary labor and are self-explanatory. Using the conventional lines much time is consumed, for no other result than to make the drawings obscure, and to require a key for their interpretation. Surely perverted ingenuity can do no worse.

I have taken more of your space than the argument will justify, but not more than the subject will. The case is so plain as to need but to be stated in order to be clear, and yet the mechanical world goes on consuming time in devising and using these schemes, and with no other effect than to defeat the very purpose for which it is all intended; and while my opinion differs from the practice of most, perhaps all of your readers, I challenge them all to show a single valid argument opposed to my position; and when they fail, as they surely will, I call upon them to abandon all such schemes and to adopt the better way.

FRED. A. HALSEY.

Tarrytown, N. Y.

The Blower Question.

Editor American Machinist:

I note the reference to the power required to drive a blower, in your issue of August 13. On one occasion I had a No. 3 Sturtevant pressure blower, and, in fixing up the shafting, etc., connected it with the furnace and blast pipes, to try it for speed. We were running it by a small engine at the time, 3″x4½″, which could bring it up to about 3,500 revolutions, with the gates closed, or nearly so. We then took off a cap near the fan, so as to blow into the open air, and the engine at once dropped down to two-thirds its former number of revolutions, and, on closing the cap, again ran the fan at its former speed, the pressure of steam remaining the same.

JOHN IVES.

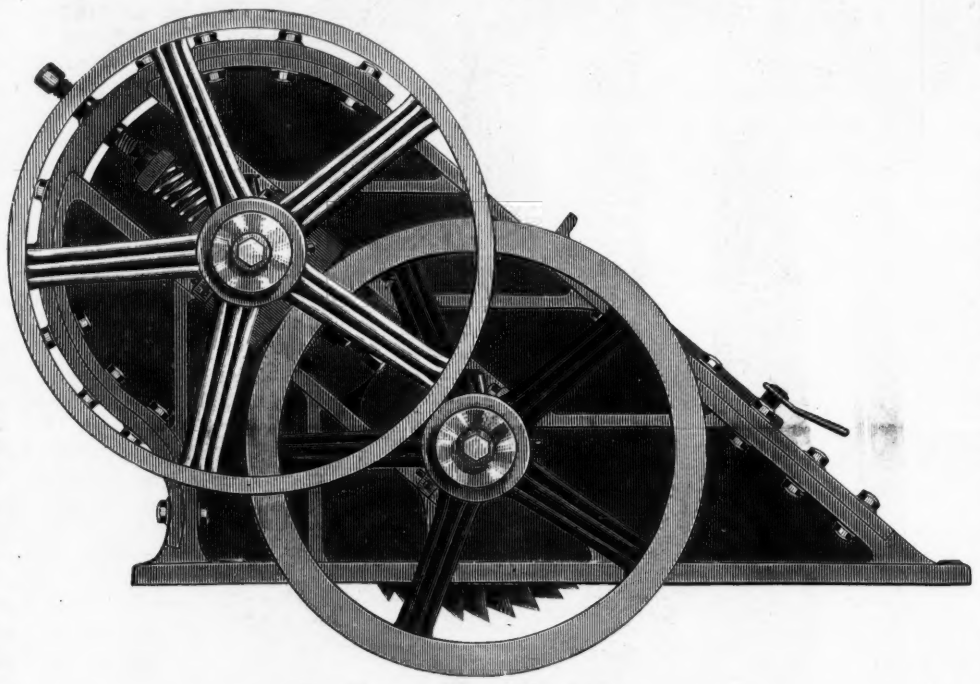
The National Cane Shredder.

The machine which we illustrate herewith belongs to the modern system of sugar-working. Some four years since the manufacturers built one of them and placed it on Governor Warmoth's plantation, in Louisiana, under a guarantee that it should shred a given quantity of cane per hour, and that with shredded cane his milling machinery should give a large increase in extraction of cane juice. Under these conditions the machinery was erected, and operated on the plantation, the result being successful. Since then the manufacturers have built and placed in Louisiana some six or eight of these machines, and are now introducing them rapidly into Cuba, and nearly all the countries where sugar cane is grown.

The machine is massively and compactly built. The larger sizes of these machines, it is said, will shred from 30 to 50 tons of cane per hour, receiving it from the ordinary cane carrier, to which it is supplied, the same as though the cane were to be crushed in the old-fashioned way between the mill rolls. By this previous operation (shredding the cane) the mill is relieved of the crushing of the cane, which is a process preparatory to the extraction of juice. The shredding or disintegrating is done by the shredder with much less power than formerly used to crush the cane in mill rolls. When this shredded mass of cane, which is thoroughly saturated with cane juice, is fed into the mill rolls, the extraction of juice is very rapid and complete, the yield of juice being much larger than could be obtained from the same mill from unshredded cane.

The working parts consist principally of two heavy shafts made of steel, on which are mounted cutting surfaces which are made in interchangeable sections. These cutting surfaces are of steel castings, and so fitted that one set can readily be removed and others substituted in their place with very little time and labor.

The machinery is fitted with several important devices to avoid expense and delays in taking off the cane crop. Among others are the safety attachment or relieving spring, attached to the feeding roll of the machine. This is so arranged that should any foreign substance, like a crowbar or car coupling, be fed into the machinery with the cane (a not uncommon occurrence) this safety attachment allows the roll to move backward so as to pass the foreign material without injuring the shredder, while at the same instant it gives a timely warning of its presence, so that it can be removed before it can enter or injure the mill rolls. This feature is a valuable one, as it guards against the breakdowns and delays which are constantly occurring on plantations using the ordinary machinery. This machine is built by the Newell Universal Mill Company, 10 Barclay street, New York.



THE NATIONAL CANE SHREDDER.

Chats with Foundrymen.

BY ROBERT E. MASTERS.

A reader of the AMERICAN MACHINIST, who has carried on the foundry business for a number of years in Connecticut, visited our shops a short time ago, and, seeing several moulders engaged on loam work, expressed surprise that I had not written more on the subject of loam moulding. It would be safe to say this branch of moulding is not practiced in one foundry in every one hundred, and take moulders of all classes it will not overstep the mark to say that not one in every three hundred know anything about loam moulding. For that reason I only write on that class of work when it is necessary to complete a series. It is out of the question to tell a man, on paper, how to mix up a batch of loam; of course a good many ideas can be given, but a mixture that will do here will not answer in a town fifty miles away, on account of some difference in the sand obtained there. In our shops and others that I know of, the use of manure, which was thought several years ago to be indispensable, has been entirely done away with, although continuing to use the same sand, but employing a little more "grit" in the mixture.

The science of moulding is in green sand or skin-dried work, which is simply green sand moulds having the surface sprinkled with molasses-water and properly dried. Quite often it is only necessary to skin-dry one or two points in the mould. Of course there are castings which of a necessity we must continue to make in loam, but many castings are made to-day in green sand in one-half the time they were made twenty years ago in loam, when it was thought impossible to make them in green sand. It is not necessary to go back as much as one decade instead of two to find some of the Tubal Cain methods of working dispensed with.

The author of a good article on foundry practice in AMERICAN MACHINIST, April 2, 1887, says: "It would pay some enterprising firm to get up a new shrink rule" etc., etc. His ideas of shinkage of castings, given from his experience and contained in the same article, are valuable, but wouldn't it be a brilliant idea and a grand thing for the patternmakers and moulders if some one could get up a scale of mixtures that would shrink according to the new rule after the enterprising firm got it up? Unfortunately for us all, if the iron shrinks according to the rule to-day, a change in the mixture to-morrow will show a different shrinkage, and even if we try to make the same mixture a few days in succession our brothers at the blast furnace are liable to make our rule go astray by making a change in mixing the ores.

The best we can do is to strike an average. The following table of shrinkages I have obtained by keeping record for several years past of accounts on this question in different mechanical and scientific journals, tables in mechanics' hand-books, and the experience of three large foundries in different cities, combined with my own experience and observation:

AVERAGE SHRINKAGE OF METALS.

Loam castings	$\frac{1}{12}$″	per	foot
Dry sand castings	$\frac{1}{10}$″	"	"
Pipes on end	$\frac{1}{8}$″	"	"
Girders and beams	$\frac{1}{8}$″	per	15″
Heavy engine beams	$\frac{1}{8}$″	"	18″
Green sand castings	$\frac{1}{10}$″	"	foot
Thin brass castings	$\frac{1}{8}$″	"	9″
Heavy brass castings	$\frac{1}{8}$″	"	10″
Ordinary brass castings	$\frac{3}{16}$″	"	foot
Copper castings	$\frac{3}{16}$″	"	"
Tin castings	$\frac{1}{4}$″	"	"
Zinc castings	$\frac{5}{16}$″	"	"
Lead castings	$\frac{5}{16}$″	"	"
Bismuth castings	$\frac{5}{32}$″	"	"

Castings not conforming to the shrinkage allowed on the patterns is one of the bones of contention between patternmakers and moulders. But there is no use to quarrel over it; it can't be remedied in that way. A little intelligent discussion will bring better results, and pay the firm who employs you more than if you wrangled over it by the hour.

Messrs. Whitehead, Barrows and others, in their articles on patternmaking, grant the foundryman his rights. Generally speaking, anyone, to hear patternmakers and moulders argue, would conclude they were born enemies. It does seem to me that any two classes of mechanics whose business is so closely linked together would study each others' interest, and try to get along on more agreeable terms than they usually do.

Pattern maker Wm. Hultgran's article on "Blunders of Foundrymen" was very interesting and amusing. As a self-constituted committee of one to represent the moulders, I must confess that we are full of blunders, and that Mr. Hultgran is right in many points. But the thorn in the flesh seems to be the "good salary" the foundryman obtained for his services; and it might have been equally as interesting to have heard his side of the story. A man need not travel over forty miles an hour for several days in succession to come across a patternmaker who makes as many blunders, and don't know any more than the average moulder. It is a common occurrence for moulders to get patterns that are not fit to make a mould with, and, if made according to the pattern, would not answer at all. Then they hear the oft-told tale, "Oh! there's only six to make off it, and you can stop it off a little here, and fill them places up over there, and file a core in a half circle, and set it in right here, and the castings will do all right." Then the moulder has to do the patternmaker's work six times in the sand, consuming about twelve hours to save the patternmaker one hour's work; and the foundry don't get any credit for it.

Often the moulder will ram a pattern up and find, "That fool of a patternmaker ain't put any hole or plate in the pattern to rap or draw it by." The result is, the moulder in trying to relieve the pattern enough to get it out of the sand punches a hole in it or splits it, especially if there are thin deep places on it, then when it goes back to the pattern room the patternmaker has his turn, because, "That dumb moulder don't know enough to come in out of the rain, much less to handle a first-class pattern."

The remedy for all this is to read more on subjects pertaining to the business of both, and consult each other in an intelligent manner as mechanics and gentlemen, thereby rendering yourselves more valuable to the firm who employ you.

If you make yourself as valuable and useful as the man who gets more pay than you do you'll get it somewhere; but if the idea that you were cut out for a superintendent or manager, or if any petty jealousy causes you to clash with a man whom the firm acknowledges is superior to their interests by paying him a better salary, you are only an injury to the firm and cannot advance yourself in that way. Energy, push and skill, combined with honesty and gentlemanly qualities, is sure to bring its reward, and if you feel your ability or worth is not recognized it is a duty you owe to yourself to go where it will be, and if you have over-estimated your talent when placed on your merits alone you will soon realize it and find your level.

Rotary Steam Snow Shovel.

The Cooke Locomotive and Machine Company, Paterson, N. J., are now about commencing to build ten rotary steam snow shovels. Nine of these have been ordered by the following railroads: Two for the Union Pacific; four for the Northern Pacific; one for the Colorado Midland; one for the Oregon Railway and Navigation Co.; one for the Central Pacific; and one for sale. The Cooke Locomotive and Machine Company built one of these rotary steam shovels some time ago, and experimented with it on one of the western roads, where it worked satisfactorily. Improvements have since been made, and Mr. John S. Cooke, president and general manager, believes that the snow shovel has now been brought to a state of perfection which will meet all the demands made upon it, and that it is only a question of time to make its adoption universal on railroads liable to be blockaded by snow. He also expects to receive more orders for these shovels before the winter is over, and that during next summer they will be kept quite busy building a large number of them.

It is said that iron furnace slag can be converted into an excellent fertilizer by the application of 5 per cent. of Prussian saltpeter to the mass and then grinding it.

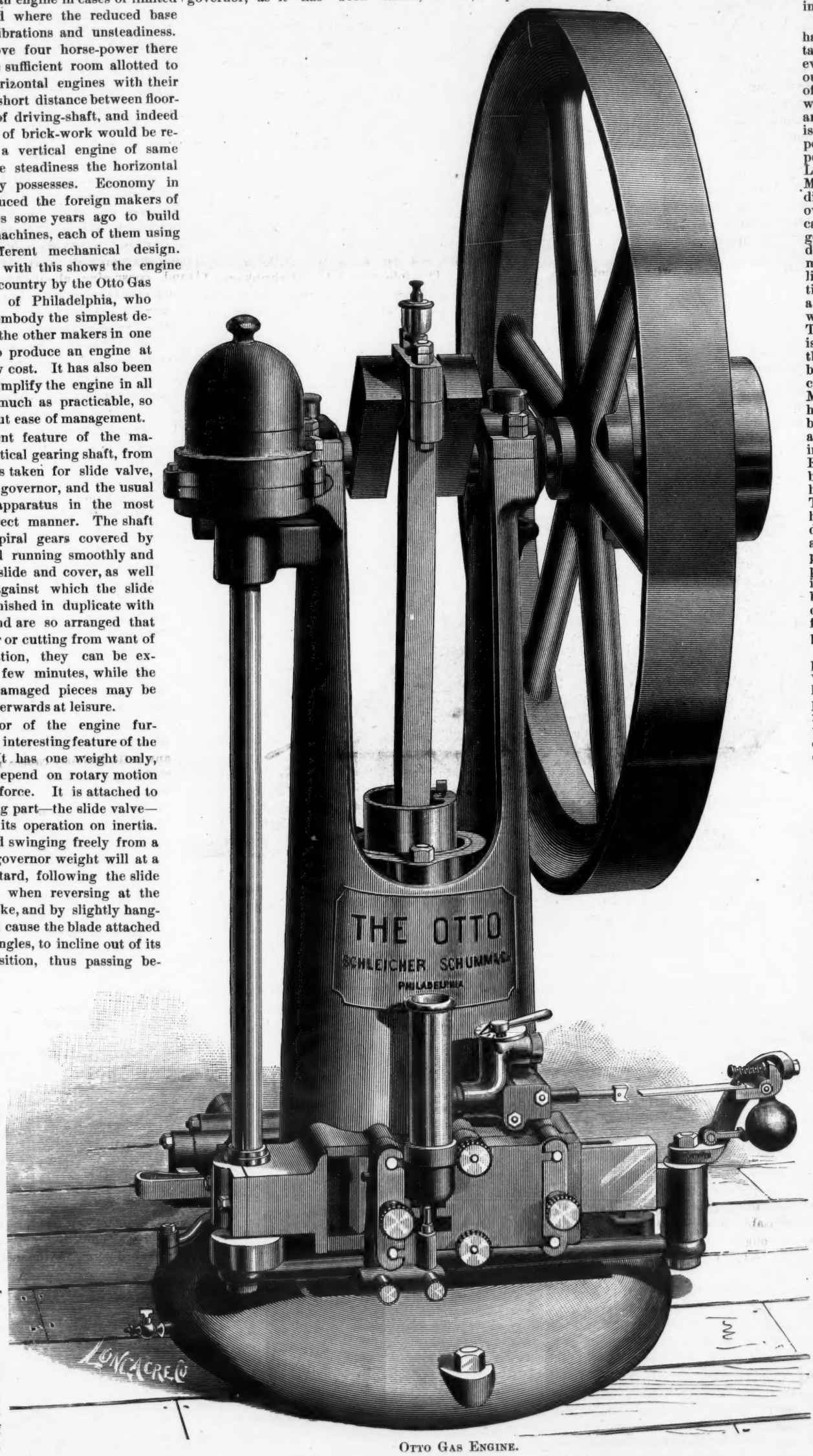
New Vertical Otto Gas Engine.

The advantage in view in designing this engine was to economize in the room required to place an engine in cases of limited power only and where the reduced base will not cause vibrations and unsteadiness. For engines above four horse-power there can generally be sufficient room allotted to admit of the horizontal engines with their broad base and short distance between floor-line and center of driving-shaft, and indeed a good amount of brick-work would be required to give a vertical engine of same power the same steadiness the horizontal engine naturally possesses. Economy in floor space induced the foreign makers of the Otto engines some years ago to build small vertical machines, each of them using their own different mechanical design. Our illustration with this shows the engine as built in this country by the Otto Gas Engine Works of Philadelphia, who have aimed to embody the simplest devices used by the other makers in one machine, and to produce an engine at moderately low cost. It has also been the design to simplify the engine in all its details, as much as practicable, so as to bring about ease of management.

The prominent feature of the machine is the vertical gearing shaft, from which motion is taken for slide valve, exhaust valve, governor, and the usual small oiling apparatus in the most simple and direct manner. The shaft is driven by spiral gears covered by an oil box and running smoothly and silently. The slide and cover, as well as the plate against which the slide works, are furnished in duplicate with each engine, and are so arranged that in case of wear or cutting from want of proper lubrication, they can be exchanged in a few minutes, while the surfacing of damaged pieces may be undertaken afterwards at leisure.

The governor of the engine furnishes another interesting feature of the new motor. It has one weight only, and does not depend on rotary motion or centrifugal force. It is attached to a reciprocating part—the slide valve—and relies for its operation on inertia. Suspended and swinging freely from a small pin the governor weight will at a given speed retard, following the slide in its motion when reversing at the end of the stroke, and by slightly hanging back, will cause the blade attached to it at right angles, to incline out of its horizontal position, thus passing below the gas valve stem when slide further advances, and omitting a charge of gas. Our engraving shows blade propped up in horizontal position by means of a small stop leaning against the weight, and so placed for meeting the gas valve when starting engine. After the engine begins to run, this stop will disengage itself at the first hanging back of the weight, falling from its horizontal into a vertical position. By this provision the gas valve cannot be opened and cause leak of gas in case of accidental stoppage of engine, as, unsupported by the stop, the weight will carry the blade high above the gas valve stem and out of its reach. This safeguard the engine has in common with the rotary governors in use on the horizontal Otto gas engines. The pendulum governor, as it has been called, is an invention of the Messrs. Crossley Brothers, the well-known English makers of the Otto engines. It has been found so accurate in its regulation of speed and so simple in its parts that the Otto Gas Engine Works in Philadelphia have adopted it also on some sizes of their horizontal engines.

The engine illustrated is of one actual horse-power, and the gas consumption when full power is developed will not, it is said, exceed 35 cubic feet, but hardly reaches half this amount on average work.



OTTO GAS ENGINE.

In Glasgow, in order to induce families to use gas for cooking, the Corporation lets stoves at a low rate.

Information about Idaho.

The Union Pacific Railway Company have issued a pamphlet devoted to the Territory of Idaho, and containing considerable information. We quote some extracts:

The most of our watercourses, having their source in the highest mountains, furnish abundant power at most every point where it is necessary, without paying for. There are a number of saw-mills in different sections, as well as some shingle machines. All are doing a good business. Lumber is worth at the mills from $12 to $20 per thousand feet; shingles $4 to $6 per thousand, according to quality. Lumber in the tree is not paid for. More mills would be a convenience in different localities, and would pay the owners handsomely for their outlay of capital. Machinists and engineers can get employment at from $4 to $6 per day, but would advise none but the most skilled workmen, and only a limited number. Millwrights sometimes get from $7 to $16 per day, but a large number could not expect to get work. Chair factories would do well. There are none in the country. There is plenty of good average timber for this purpose. Flouring mills do a good business. There are but few in the country, and many more are needed. Many places would give a bonus to have mills built. Sash, doors and blinds are all shipped into the country, and come high. Here is a money-making investment. The demand is good. Even though the timber is not of the best quality, much clear lumber can be had for this purpose. Tanneries.—There are none in the country. Tons of hides are shipped East and West almost daily. The leather is sent back to us, and we are compelled to pay a high price for it. Potteries.—One or more potteries would do well; there are none in the country, whilst we have good beds of clay for that purpose. Large quantities of such ware are shipped from the East to us, and sold at high prices.

The Oregon Short-Line Railroad Company have located and built extensive works and machine shops, round-houses, etc., at Shoshone. The company's buildings are constructed with natural lava rock, and are durable, as well as artistic in appearance. At present there are about two hundred men employed.

Engineers' Pocket Books.

Good mechanical or civil engineers' pocket books are not numerous, which is not to be wondered at when the time required to prepare such a work is considered. As a consequence, those that are good meet with a sale which it is to be hoped—but hardly believed—pays the authors for the work of some of the best years of their lives. Not many who use such books, of six or eight hundred closely printed pages, ever stop to think of the years of patient, careful labor required to collate the matter, eliminate errors, and investigate and make experiments. It would be little less than miraculous if some errors were not found in such a work, but as it goes through successive editions these get weeded out, and to that extent the book becomes more valuable. The wonder is, after all, that there are so few mistakes. If a plain mistake is found in a work of this kind, the finder will confer a favor on the author—and on future generations of users—by calling his attention to it. Most authors of pocket books have profited by suggestions of this kind. They are not presumptuous or conceited enough to think they are likely to deal with some thousands of subjects and a myriad of figures without somewhere falling into error. The best pocket books are those that have grown to their present size by degrees; additions and amendments being made as new editions are published. As showing the overlapping of civil and mechanical engineering, it may be noted that one of the most popular of civil engineers' pocket books is sold largely to mechanical engineers, machinists, and those engaged in similar work. The preparation of an engineer's pocket book requires a peculiar tact in condensation; the faculty for saying a good deal in few words, and saying it clearly.

AMERICAN MACHINIST

To prevent delays all Communications should be addressed to the Company.

PUBLISHED WEEKLY
BY
American Machinist Publishing Co.
HORACE B. MILLER, Pres't and Bus. Manager.
LYCURGUS B. MOORE, Treas. and Sec'y.
96 Fulton Street, New York.
F. F. HEMENWAY, Mechanical Engineer.

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"Business Specials," 50c. a line.

The American News Company,
Publishers' Agents, New York.
The International News Company,
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NEW YORK, AUGUST 27, 1887.

CONTENTS.

	PAGE
Machine for Grinding Punches and Dies	1
The Milling Machine—Its Construction and Uses. By John J. Grant	1
Boston Model of Shipman Engine	2
Early Engineering Reminiscences. By George Escol Sellers. Thirty-third Paper	2, 3, 4
Practical Drawing. By J. G. A. Meyer. Thirty-first Paper	4, 5
P. R.R. Repair Shops at Altoona, Pa	5
Hangers for Truck Centers	5
A Rare Example of Honor	5
Letters from Practical Men—Conventional Section Lines. By Fred. A. Halsey—The Blower Question. By John Ives	5, 6
The National Cane Shredder	6
Chats with Foundrymen. By Robert E. Masters	6
Rotary Steam Shovel	6
The Vertical Otto Gas Engine	7
Information About Idaho	7
Boiler Inspection and Boiler Explosions	8
A Neglected Opportunity	8
Literary Notes	8
Questions and Answers	8, 9
Manufactures	9
Machinists' Supplies and Iron	10

Boiler Inspection and Boiler Explosions.

During the past fifteen years there have been numerous theories advanced to account for boiler explosions upon other than plain natural laws. Every one of these theories has worked harm to the extent that it has found believers, because it has called attention away from the real cause, and in some degree has been accepted as a defense of incompetency and dangerous practice. When a boiler explodes there is always one of two reasons for it; the material or workmanship, either or both, were bad, or it has been ignorantly used. This has come to be accepted by nearly every one of intelligence who has given the matter attention. Absolute failure to bring about explosions, or conditions that would account for explosions, in accordance with any of these semi-supernatural theories has led to their abandonment by sensible people. But there is an alarming frequency of boiler explosions, and the yearly list of killed and wounded from this cause is a large one. There are many who believe that the remedy for this is in State inspection laws. There is little room to doubt that proper inspection laws competently administered would do a good deal in the way of reducing the number of boiler explosions, but such laws, to be of much service, should be more comprehensive than any we have yet heard spoken of, and inspection should not be of the usual political quality. Inspection should cover material and workmanship to a greater extent than has been contemplated.

Regarding material, too much dependence is placed upon the stamp on the plates. This is particularly true in relation to stationary boilers. It is very seldom that anything is known by the builder, by actual test, of the quality of the material he uses. This knowledge is concluded by the legend of the stamp, and indications in working. We do not say this is true in all cases; there are boiler makers who insist upon knowing something more than this of the quality of the material they use, but it is true in a majority of cases. Many manufacturers of boiler plate are entirely honest, beyond doubt, but it would be too much to believe that there was no dishonesty practiced in making and stamping boiler plates. And the honest ones are liable to mistakes. For these reasons there should be rigid inspection of material before it goes into the boiler. Honest plate makers would favor this because it would free them from the competition of the dishonest, if there are such. Good boilers are not made of stamps, and there is little reason to doubt that the story told by the stamp is sometimes deceptive, accidentally or intentionally. It is not early enough to begin inspection after the boiler is built.

But the best of material will not insure a safe boiler unless it is properly worked and unless the general construction is good. And with the boiler maker, as with the plate maker, there may be honesty and dishonesty. Unfortunately, we know there is sometimes ignorance. The State cannot say that one boiler maker is honest and another dishonest; that one is competent and another incompetent; it can say that inspection shall begin in the boiler shop, and that boilers shall not be used if made of poor material, or if methods of construction generally recognized as unsafe and destructive are employed.

Ignorance in one way or another is undoubtedly the prime cause of a majority of all boiler explosions. There are but few purchasers that do not consider themselves as competent to judge of the quality of a boiler as they do of a thing they know something about; experience proves that the majority of them conclude their judgment by the price asked. When a boiler explodes the boiler maker is likely to be the one blamed. Good judgment would often place quite as much of the blame on the purchaser. Not that he knows much about the matter, but that he ought to have known or have paid for the services of some one who did know, to represent him. It is true there is no excuse for the boiler maker who will be hired to build a poor boiler, but there is just as little excuse for the man who hires him to do it. Ignorance in the matter ought not to be accepted as an excuse. Under the present plan of buying and using boilers—the lowest bidder getting the job—that have been subjected to no inspection whatever, either of material or workmanship, there is strong temptation for the boiler maker to use poor material and do cheap work in self-defense, as it were. It is one of the rules of trade that a man can buy almost anything as poor in quality as he likes, and nothing but inspection all the way from the iron or steel to the finished boiler will prevent boilers poor in quality of stock and workmanship from going into use.

The last and crowning place where ignorance gets in its perfect work in boiler destruction is in their management. It cannot be anything but ignorance that induces an owner to put an incompetent man in charge of boilers because he will work cheap, for it has been demonstrated time and again that there is nothing cheap about the matter but the wages paid. The fact that a man will take a job as engineer for a little less than ordinary laborer's wages is fairly good evidence that he not only knows nothing about caring for a boiler, but that he is not competent to do, or learn to do, anything well.

No one thing—except universal honesty, which is not imminent—is likely to put a stop to boiler explosions. Competent inspection that begins with the material and workmanship will help in the work. A willingness on the part of purchasers to pay a fair price for good work will have excellent effect. With these, and none but competent men in charge of boilers, explosions will be rare.

A Neglected Opportunity.

The neglect of American manufacturers to study the wants of the South American states is losing them a great deal of trade. The people of those states have a natural prejudice in favor of goods of American manufacture, but our manufacturers are no nearer to supplying them than they were ten years ago. Recently an engineer from this country, who has spent most of his time, professionally, in South America during the past five years, said that wherever he went he found that American machinery and implements were highly spoken of, but that little or no attempt was made by Americans to build up a trade, while agents of European countries were everywhere, looking sharply after the wants of the people. One thing he thought operated against American manufactures was the fact that most of the engineers to be found there were Europeans; these naturally worked in favor of the countries they came from, and their views had weight in the matter of buying machinery. With the excellent opinion of American products, he thought, however, that personal effort would build up a good and increasing trade.

Secretary Whitney is reported as being highly pleased with the fact that he has received favorable bids for the building of the cruisers and gunboats last authorized by Congress. Possibly the Secretary had some doubts in the matter, but there was no occasion for them. If there is any lack of facilities in the works of the country to build anything that Congress authorizes these facilities will be provided without serious delay. All the vessels and all the guns that the country can pay for, large or small, can be turned out in reasonable time. This ought not to be news to Secretary Whitney.

There are two sides to the land booms that appear to have full possession of many Western and Southern cities. One is the present apparent increase in valuation, which makes a pleasant impression. We say apparent, because there is little probability that these values can be maintained, except in rare instances. The other side is not so pleasant. The fictitious increase in values almost invariably leads to unwarrantable municipal expenditures, then, when the shrinkage comes, there comes with it municipal bankruptcy, or something near to it. That has been the fate of more than one ambitious Eastern city. Another bad feature is, that the high price of land prevents many from owning houses, who would otherwise settle down as permanent and valuable citizens.

The fight against the Baltimore & Ohio Railroad bridge to Staten Island has ended in favor of the bridge. It was in the main a railroad fight, in which the public had little interest, except that in the end it will have to pay the cost. These railroad battles cost considerable money, and where they are directed against the progress of a rival company never appear to succeed any further than to delay progress. Most people will be glad, however, when the Baltimore & Ohio, through much tribulation, reaches New York. If it does nothing else it will give better ferry service to Staten Island.

Literary Notes.

THE GRAPHICAL STATICS OF MECHANISM is the title of a new work by Gustav Hermann, Professor in the Royal Polytechnic School at Aix-La-Chapelle; and has been translated and annotated by A. P. Smith, M. E. The great object of this treatise is to present a wide application of the long known but little used angle of friction. It treats on the Efficiency of Mechanisms, the Equilibrium of Mechanism, Sliding Friction, Journal Friction, Rolling Friction, Chain Friction, Stiffness of Ropes, Tooth Friction, and Belt Gearing. All the results are obtained by graphic methods clearly stated. The whole subject is presented in a simple manner, so that, by the use over and over again of a few easily mastered principles, the most complicated problem may be solved. No knowledge of higher mathematics is required in its mastery, and no handling of lengthy and involved algebraic formulæ is necessary in its use. All the knowledge required in a perusal of this work, is the laws of elementary mechanics, elementary geometry, elementary algebra and a knowledge of drawing. With these acquirements a bright mechanic will soon master all the problems given in this work with beneficial results to himself. This treatise is intended for a text book for technical schools, and also for the use of machinists, architects and engineers, by whom we have no doubt it will be appreciated. This book contains 150 pages, 59 illustrations given on eight plates at the end of the work, and is published by D. Van Nostrand, 23 Murray and 27 Warren street, New York. Price not given.

QUESTIONS AND ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common-sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials nor location will be published.

(346) S. S. C., Jersey City, N. J., writes: Will you please settle the following dispute: Two boats are placed side by side (both boats exactly the same), 200 feet from shore in dead water; a rope is tied to the bow of one and pulled to the shore by one man. The other, to be pulled by two men, one to stand at the bow with rope in hand, pulling hand over hand; while the other man is pulling in the same manner on the same rope from the shore. Now, which boat will reach the shore first? All the three men have equal strength. *A.*—The boat pulled by one man will reach the shore first, because he has the weight of one man less to pull. But if you put a weight in one boat equal to the weight of the man in the other boat, then both boats will reach the shore at the same time. This cannot be otherwise, because the pull on the rope in one case is equal to the pull on the rope in the other.

(347) J. S. P., Baton Rouge, La., asks: Will you kindly inform me and some others how early feathering paddles were used, either on sea-going or river side-wheel steamers? *A.*—We believe the first feathering paddle-wheels were used in the year 1848. We do not know of any being used prior to this.

(348) J. G. T., Corvallis, Oregon, asks What prevents a great back pressure on the exhaust side of the high-pressure cylinder of a compound engine? *A.*—The arrangement of the valve gear; but generally you may assume that at any instant the back pressure in the high and the forward pressure in the low-pressure cylinder is about the same (a little less in the latter). To explain this thoroughly would require a description of the compound engine, which would take up too much space in these columns.

(349) A. B., C., Bridgeport, Conn., writes: Suppose a boiler eight feet long, five feet in diameter, carrying 80 pounds of steam to the square inch, and having the stay-bolts three inches long between the fire-box and shell, placed five inches from center to center—that is to say, four stay-bolts in the square of five inches, will you give me the pressure upon these stay-bolts, and also a rule for finding the same? *A.*—The pressure which each stay-bolt will have to resist will be equal to the total pressure on a surface five inches square; hence 5×5×80=2,000 pounds.

(350) Apprentice Machinist, Atlanta, Ga., writes: 1. I am building two engines, cylinders 5¾×9½ inches. Will you please tell me what size steam and exhaust pipes I should use—the engines having the plain slide valves, and work together on the same axle? *A.*—You do not state the speed of these engines. Assuming that they will have to make 200 revolutions per minute, then for each engine the steam pipe should be 1¼ inches inside diameter, and the exhaust pipe 1½ inches diameter. 2. About what is the horse-power of an upright boiler 44 inches in diameter, 9 feet high, 125 two-inch tubes, the tubes being 6 feet long; grate surface, 3 feet in diameter? *A.*—About 20 horse-power. 3. Would this size boiler furnish steam for the two engines? *A.*—You do not state the amount of work required of these engines; but assuming they are to make 200 revolutions with 80 pounds of steam, then your boiler will not be large enough.

(351) L. Y. C., Danielsonville, Ct., asks: What is the formula used and the general mode of procedure to ascertain the volumes of steam cylinders, with given initial pressure, in high-pressure cylinder; steam following full stroke in high and expanding in low-pressure cylinder, as in the ordinary Worthington pumping engine—horse-power, of course, being also given? *A.*—The ratio of cylinder capacity seems to be the chief point at issue between rival engineering establishments, as well as between engineers generally. No regular rule has been established; this ratio is, within certain bounds, subject to the fancy or judgment of the designer. The aim is to distribute the power equally over the working parts of a compound engine, and therefore both cylinders are so proportioned that each will give out nearly the same power. In some practice, when the diameter of the low-pressure cylinder does not exceed 100 inches and the boiler pressure 70 pounds, the ratio of the low pressure to the high-pressure cylinder would be 3.5; for a boiler pressure of 80 pounds, 3.75; for 90 pounds, 4.0; and for 100 pounds, 4.5.

(352) L. K., New Haven, Conn., writes: 1. Please tell me how to find the depth of a 60° triangular screw thread? *A.*—If we assume a line to be drawn from the top of one thread to the next one, then the sides of the threads and the assumed line will form an equilateral triangle. The length of the assumed line will be equal to the pitch, and consequently, when we know the pitch, we know the length of the sides of the equilateral triangle. To find the depth of the thread, we have to find the perpendicular height of an equilateral triangle, which is found by multiplying the length of one side by the decimal .866025. Therefore, to find the depth of the thread, multiply the pitch by .866025; the product will be the depth of the thread. Example: The number of threads in a quarter-inch bolt is 20. What will be the depth of the thread? 1-20×.86602=0.043301. In this example it will be seen that multiplying the pitch by .86602 amounts to the same thing as dividing the decimal .86602 by the number of threads per inch; hence, for finding the depth of a 60° triangular screw thread having no flat top and bottom, the following rule can be used: Divide the decimal .86602 by the number of threads per inch; the quotient will be the depth of thread. 2. Which of the two threads is the American standard—the triangular screw thread without flat top and bottom, or the triangular thread with flat top and bottom, and how do you calculate the last one? *A.*—The thread accepted as a standard in this country is that established by the Franklin Institute, or the "Sellers" dimensions, and is the triangular thread having a flat top and bottom. The angle between the two sides of the thread is 60°, and the width of the flat top and bottom (measured lengthwise of the bolt) is one-eighth of the pitch each. Consequently, to find the depth of the thread with flat top and bottom, divide the decimal .6495 by the number of threads per inch; the quotient will be the depth of thread. Example: Number of threads per inch is 20. What will be the depth of the thread? .6495÷20=.03247.

(353) J. W. P., West Bay City, Mich., writes: A dispute has arisen in our engineers' association, and we have agreed to leave the matter to the AMERICAN MACHINIST. The matter may be stated as follows: Take a common spool of thread, or anything similar to it; cut a piece of card the size of the spool, stick a pin through it, and lay it on the end of the spool, with the pin in the hole; it is now impossible to blow off the card by blowing through the hole in the spool. What is the reason for this? *A.*—If you will watch the piece of card, you will see that it is forced a little way from the spool, or more generally is tilted a little, one edge remaining in contact. The explanation appears to be that the air forced through the hole in the spool finds its way out from beneath the card in currents, and these currents, by induction, produce a partial vacuum, the pressure of the atmosphere holding the card to the spool. If the card is a little larger than the spool, so as to project a little beyond it, the effect is more noticeable. In that case it appears that the escaping air makes, by induction, the pressure a little less under the overhanging edge than the pressure of the atmosphere. By varying the thickness of the disk of paper from quite thin letter-paper to cardboard, the operation can be better traced. By placing the disk a little way from the end of the spool, holding the latter horizontally, blowing through the hole will cause the disk to approach the end of the spool. The pin appears to have no further use than to prevent the disk from sliding off the end of the spool laterally. What occurs can perhaps be better seen by an experiment noted in Ewbanks' Hydraulics and Mechanics, described as follows: "Lay two books of the same size, or two pieces of board, six or eight inches apart on a table, and place a sheet of paper over them; then blow between the books, and the paper, instead of being displaced by the blast, will be pressed down to the table by the atmosphere above it, and with a force proportioned to the intensity of the blast. Instead of the mouth, use a pair of bellows by inserting the nozzle under the edge of the paper, and the effect will be the same. The stream of wind may even be directed partly against the under side of the paper, which, notwithstanding, will be pressed down as before. Suspend the books or fix them to the under side of the table; then hold on the paper till the blast is applied, when the sheet will be suspended against gravity."

BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

New Book for Machinists. See adv., p. 16.

Link-Belting.

Send for catalogue of Link-Belting.

Over 50,000,000 feet of Link Belt in use.

Link-Belt Machinery Co., Chicago and N. Y.

Shafting Straighteners. J. H. Wells, Tampa, Fla.

Steel Name Stamps, etc. J. B. Roney, Lynn, Mass.

AirCompressors,RockDrills. J.Clayton,43 Dey st.,NY

Exhaust Tumbl'g Bbls. Henderson B's.,Waterb'y,Ct.

Upright Drills from 20" to 36" inclusive. Currier & Snyder, Worcester, Mass.

For Improved Cooper Stoves, send to Variety Machine Co., Warsaw, N. Y.

Light articles built to order by the American Sewing Machine Co., Philadelphia, Pa.

The Best Upright Hammers run by belt are made by W. P. Duncan & Co., Bellefonte, Pa.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Pattern and Brand Letters. Vanderburgh, Wells & Co., cor. Fulton and Dutch sts., New York.

Selden Packing, for stuffing-box, with or without rubber core. Randolph Brandt,38 Cortlandt st., N.Y

Solid Nickel-Seated "Pop" Safety Valves. Consolidated Safety Valve Co., 111 Liberty st., Y. N.

Robbs' Patent Composition for case-hardening. Send for circular. F. W. Tasney, Paterson, N. J.

Davis Key-Seating Machines, kept in stock, by Manning, Maxwell & Moore, 111 Liberty st., N. Y.

"Bradley's Power Hammers, the best in the world." 20 sizes. Bradley & Co., Syracuse, N. Y.

Injectors, Ejectors, Oil Cups, Sight Feed Lubricators, etc. Arthur Appleton, 45 Cortlandt st., N.Y.

Ice and Refrigerating Machines. 124 built, and all successful. David Boyle, 521 Monroe St.,Chicago, Ill.

Drawing Materials, all kinds. Get catalogue. Mention this paper. G. S. Woolman, 116 Fulton st., N. Y.

The Improved Tabor Steam Engine Indicator, made and sold by The Ashcroft Mfg. Co., 111 Liberty st., N. Y.

Engine Lathes, Hand Lathes, and other fine tools. Assortment large; prices low. Frasse & Co., 92 Park row, N. Y.

Curtis Pressure Regulators, Curtis Return Trap, Curtis Damper Regulator. See Aug. 20, p. 12. Send for circular No. 17. Curtis Reg. Co., Boston, Mass.

Machinists' supplies, brass goods, m'f'rs' supplies, polishing materials, all kinds wire, metals, etc.; in any quantity. Jordan & Gottfried, 208 Canal st.,N.Y.

For Best Return Steam Traps, Pressure Regulators, Positive-Acting Pump Govs., Back-Pressure Valves. T. Kieley, 11 W. 13th st., N.Y. Send for des'n.

Press for sale. Quick-acting; hole in bed, 8x5, punches to center of 13-inch sheet; 2¼-inch shaft; also four-spindle Drill. B. W. Payne & Sons, Elmira, New York.

Reed's Engineer's Hand-Book to the Local Board Examinations. Eleventh edition revised and enlarged, with 260 diagrams and 36 large plates. 8vo., cloth, $4.50, post-paid. Catalogue of books free. E. & F. N. Spon, 35 Murray st., New York.

"Indicator Practice and Steam Engine Economy." By F. F. Hemenway. Contains plain directions for using the indicator, and making all required calculations from the diagram; also the principles of economy in operating steam engines, and current practice in testing engines and boilers. Price, $2 post-paid. Published by John Wiley & Sons, 15 Astor Place, New York.

"Binders" for the AMERICAN MACHINIST. Two styles—the "Common Sense," as heretofore sold by us, and mailed to any address at $1.00 each, and the "New Handy," mailed at 50c. each. The former has stiff board covers, while the latter has flexible covers, the full page opening flat. Either will hold the entire 52 issues of any volume. AMERICAN MACHINIST PUB'G CO., 96 Fulton st., New York

MANUFACTURES.

Ogallala, Neb., wants water-works.

The water-works at Tyler, Texas, will be enlarged.

The citizens of Downs, Tex., have voted $30,000 for water-works.

Ground has been broken at Fall River, Mass., for Globe Yarn Mill No. 3.

A ramie manufactory is soon to be established at Yorktown, Dewitt county, Tex.

Bonds to the extent of $35,000 will be issued to build water-works at Cimmarron, Kan.

E. M. Thompson is interested in building an electric light plant at Monticello, Iowa.

L. M. Eastman, Baltimore, Md., will rebuild his furniture factory, recently destroyed by fire.

The Albion Manufacturing Company, Albion, Mich., is building a large addition to its shops.

The Englehart Elevator Company will soon begin the manufacture of elevators at Springfield, Mass.

Robert E. Libby has taken the Western agency for the American Brake Company—office, 242 Clark street.

The Seibert Patent Pulley and Journal Box Company, St. Louis, Mo., will increase their capital stock by $50,000.

The Norfolk and Western Railroad Company have under consideration the building of shops at Burkeville, Va.

A new company, known as the Davenport Foundry and Machine Works Company, will erect works at Davenport, Iowa.

The Anniston (Ala.) City Land Company are negotiating with capitalists to establish works for building iron safes.

J. R. Markle and J. C. Tillotson, of Detroit, are forming a $250,000 Edison Electric Light Company in East Saginaw, Mich.

Miller & Bokenkamp, whose foundry and machine shop at Fort Madison, Iowa, were recently destroyed by fire, will rebuild at once.

The Grand Rapids Reed and Rattan Furniture Company, of Fourth street, Grand Rapids, Mich., are preparing to incorporate.

Mankato, Minn., is wrestling with the water-works question, a recent vote on the proposed issue of $20,000 bonds resulting in a tie.

According to the Brenham *Banner*, the Waco (Tex.) Woolen Mills have declared a dividend of 24 per cent. for the year just ended.

The works of the Cellonite Manufacturing Company at Arlington, N. J., which were recently destroyed by an explosion, are being rebuilt.

Eastport, Me., is tugging with the water supply question. Water will have to be brought in pipes from Boyden's Lake, a distance of seven miles.

Neafie & Levy, Philadelphia, Pa., will make extensive additions to their boiler plant. They will probably put in hydraulic riveting machinery.

The New York and New England Railroad is said to intend building shops and a round-house capable of employing 2,000 men at East Hartford, Conn.

Work has been commenced at Mansfield, Mass., on a new shoe factory, 100x40, and four stories high, to be occupied, when completed, by Rumsey Bros., of Lynn.

Burns, Silver & Co., Bridgeport, Conn., manufacturers of railroad supplies, will add a 90x40 three-story building to their present works, and put a third story on the old structure.

The H. A. Williams Manufacturing Company, Taunton, Mass., has been incorporated to manufacture and sell mill supplies and machinery. John W. Hobart is president of the company.

The shops of the St. Paul and Duluth Railroad, to be located at Gladstone, Minn., have been contracted for and are to be completed November 1. They are to be of brick, one story in height, and will cost $100,000.

The Sweet & Allison Manufacturing Company has been organized at Chicago, with a capital of $150,000, for the manufacture of nail-making machines. Incorporators, David C. Sweet, Frank Allison and Frank M. Webster.

G. W. Grimes, foundryman and machinist, at Bluffton, Ind., has just completed an addition, 24x38 feet, to his establishment. He also contemplates introducing a line of farm machinery, such as corn drills and road engines.

The Saratoga Gas and Electric Light Company, Saratoga Springs, N. Y., have purchased the Eureka Spring tract of land, two miles northeast of the village, to which they will, at some future day, remove their gas-works.

A company has been incorporated, with a capital of $10,000,000, to extend the Minnesota and Northwestern road to Lake Superior by as direct a line as possible. Steamers will be built in connection with the line for transporting grain eastward.

The Bridgeport Electric Light Company, Bridgeport, Conn., have just bought a lot on John street, on which they will at once build one of the best stations in the country. They propose introducing the Baxter motor in connection with their lighting.

Captain R. E. Rose, the general manager of the Florida Sugar Manufacturing Company, Kissimee, Fla., is making extensive preparations for commencing work on the refinery. When completed this will be the largest sugar refinery in the South.

The Lowell Water Company has been organized at Grand Rapids, Mich., to supply the village of Lowell with water. Capital stock, $30,000. John E. More, Edward W. Withey, Edwin F. Sweet, Alfred C. Sekell and Edgar W. Ford, of Grand Rapids, are parties in interest.

In our July 16th issue we noted that the Louisville and Nashville Railroad were to locate new shops at Decatur, Ala. It is now explained that all their locomotive works and car-building shops are to be consolidated at Decatur into one immense concern, employing several hundred men.

The articles of incorporation of the People's Gas Light Company, of White Plains, N. Y., have been filed in the County Clerk's office at White Plains, and they have been granted a franchise to lay their mains. The directors are Charles W. Ball, president; Charles T. Brooks and George Olney.

The Fuel Gas and Electric Engineering Company, of Pittsburgh, Pa., is erecting a plant in that city for the purpose of exhibiting their process of making fuel gas. This process is intended for use in places where there is no natural gas. Gas can be made by this process from either anthracite or bituminous coal.

A contract has been made with the Pratt & Whitney Company, of Hartford, by Secretary Whitney, for the manufacture of the Hotchkiss guns, while the Winchester Arms Company, of New Haven, will manufacture the ammunition for the guns. The contracts will amount to several hundred thousand dollars.

In our issue of June 25 we referred to the Springfield (Ohio) Machine Tool Company, just starting in business. We learn that the new company, amongst other tools, will build a full line of Fox lathes. Mr. Kempsmith, one of the members of the company, was formerly connected with Warner & Swasey, of Cleveland, Ohio.

The Frazer & Jones Company, Syracuse, N. Y., who recently had a $90,000 fire in their foundry and saddlery hardware works, are now building on a site that they recently bought in Geddes, a suburb of Syracuse, several large buildings, to be known as the Syracuse Steel Foundry. The works just burned will be rebuilt immediately.

The Baxter Springs (Kan.) Investment Company is the name of a new company for improving that place. The company is composed chiefly of railroad men. Water-works and electric light works will be built at once. John E. Ennis, land and passenger agent of the Missouri Railroad, Chicago, Ill., is connected with the company.

A number of Plainfield (N. J.) capitalists have organized the Cumberland Mining and Lumbering Company, to operate in Virginia and Kentucky. Among the incorporators are Jacob Kirkner, president of the Board of Education; Fire Commissioner William H. Brower, ex-City Physician John B. Fritts, Seymour G. Smith, and Wm. C. Kelly.

It is reported from Augusta, Ga., that the Knights of Labor are negotiating for a water site near Augusta, Ga., to put up a co-operative knitting mill. It is said that the local assembly there has quite a large amount of money on hand, and has been anxious to erect a mill of this kind for some time. They will make socks, undershirts, and all kinds of knit goods.

The Tallapoosa Land, Mining and Manufacturing Company, Tallapoosa, Ga., proposes to construct within three years a woolen mill, a plaid mill, a carpet mill, a cotton mill, a jean mill, a large blast furnace, and a magnificent hotel which will accommodate 300 guests and contain all the modern improvements. The estimated cost of these improvements is something over $900,000.

Frank H. Pond, of the Pond Engineering Company, St. Louis, Mo., writes us: "We have more work under contract at the present time than ever before during the eleven years I have been in business here. Our office force is working until ten o'clock nearly every evening, with the thermometer anywhere from 104 to 110 in the shade. We are almost tempted to wish business would let up a little."

The Cleveland (Ohio) Shipbuilding Company has made a ten-years' lease with the city for the ground under one of the arches of the viaduct, adjoining their new moulding shop, whereon a large pattern shop will be erected. An addition of a five-story building on their own property will carry the office of the company up on the viaduct on the south side, and overlooking the works of the company.—*Marine Record.*

Machinists' Supplies and Iron.

NEW YORK, Aug. 11, 1887.

Iron—Sales of American pig continue to absorb the output of the furnaces, but there are few contracts for future delivery. We quote No. 1 X Foundry, $21 to $22, with $21.50 ruling price; No. 2 X, $19.50 to $20.50; Grey Forge, $17.50 to $18.

Scotch Pig—But little is doing in Scotch brands. We quote Coltness, $22.50 to $23; Gartsherrie, $21.50 to $22; Summerlee, $21.50 to $22; Eglinton, $20.50 to $21; Dalmellington, $20.50 to $21.

Lead—Prices are nominal, there being no business of consequence. Common Western is held at 4.65c., but there are no takers at this price.

Antimony—Hallett's, 8¾c; Cookson's, 9c. to 9¼c.

Copper—The market is quiet. Lake is held at 10.55c., with 10.35c. bid.

Spelter—Refined, 5¾c. to 6c.

Tin—Jobbing lots of Banca have sold at 24c.; Straits and Malacca, 23.75c.

WANTED

"Situation and Help" Advertisements only inserted under this head. Rate, 30 cents a line for each insertion. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

Wanted—An experienced man to take charge of pipe foundry. Address Box 49, AM. MACHINIST.

Six first-class machinists; none others need apply. Deane Steam Pump Co., Holyoke, Mass.

Wanted—A machinist with about one thousand in cash as a partner in a machine shop. Address Box 634, Canastota, N. Y.

Wanted—Machine draftsman; must be rapid, intelligent and of steady habits; reply, stating experience. P. O. Drawer 5,110, Boston, Mass.

Situation wanted by competent millwright, well posted in best modern practice; good workman in wood or iron. Address T. S. R., AM. MACHINIST.

Wanted—Two experienced foremen for machine shop and pattern room for Harvester Co. Address, stating age, previous experience, references, and salary expected, M. H., AM. MACHINIST.

An expert in designing and constructing pumping and general machinery is open for position as supt. and chief draftsman; been 27 years with one of the largest firms. Expert. AM. MACHINIST.

Wanted—A first-class machinist, experienced in steam pump work, as working foreman of a small shop near the city; steady employment to the right man. Address, with particulars, Box 50, AM. MACHINIST.

Wanted—A master mechanic as foreman in a sewing machine manufactory; must be first-class in all respects; none other need apply. Address, with experience, references, and salary required, A. B. C., AM. MACHINIST.

A first-class mechanical engineer and draftsman, with theoretical knowledge and extensive practical experience in designing, estimating and constructing, is open for an engagement. Address D. E. C., P. O. Box 568, Chicago, Ill.

Wanted—An experienced draftsman, with good mechanical knowledge, for machine shop working on specialties near Boston. Address, with small sample of work, stating salary expected and references, Box 52, AM. MACHINIST.

Wanted—A first-class foreman, who thoroughly understands foundry management in all its details, for an iron foundry running on special work, located near Boston, Mass. Address, stating references, Box 51, AM. MACHINIST.

Wanted—For a small foundry in Eastern Canada, a working foreman; must thoroughly understand dry and green sand work; no plate work; give references; state experience, and wages expected. Address Founder, AM. MACHINIST.

Wanted—Position as fireman in a good manufacturing establishment, or will take charge and run engine and boiler where only one man is required; good references given from last employer. Address C. Warren Robbins, Greenfield, Mass.

Mechanical draftsman, graduate M. E., with first-class references, wishes a position; able to take charge of drawing office; can act as assistant superintendent; shop experiences; can offer knowledge against capital. F. E., 34, AM. MACH.

Wanted—By a firm mfg. engines and mining mach'y in a Western city, a thoroughly competent tool dresser to dress tools for 100 men; one experienced in handling and tempering steel; steady employment to the right man. Address, with references and expected pay, Box 47, AM. MACH.

A well-known foundryman, 37 years of age, wants position as foundry foreman with a first-class firm in the North or West; is capable of superintending iron works employing from 100 to 300 men; is a practical mechanic on general and special heavy and light work in green and dry sand, and has considerable knowledge of loam moulding; specialty on mixtures for car wheels, chill and sand rolls, and all kinds of chill and soft mixtures. At present has management of foundry employing 200 men on machine, jobbing, locomotive, car and rolling mill work; good reference. Address "Vulcan," care AM. MACHINIST.

✢ MISCELLANEOUS WANTS. ✢

Advertisements will be inserted under this head at 35 cents per line, each insertion.

Gerlach's Engineers' Specialties beat the world. Send for price list. Crescent Mfg. Co., Cleveland, O.

Crescent grease cup for shafting beats them all. Sample free. Crescent Mfg. Co., Cleveland, Ohio.

Light mach'y of all kinds built at short notice Edmund Mills, 8 Dey st., Jersey City Heights, N. J.

Stationary boat engines, boilers, best, cheapest, 1 to 10 H. P. Washburn Engine Co., Medina, Ohio.

Wanted—Twelve (12) ft. planer, second-hand, in good order and cheap. Address B., Box 761, Owosso, Mich.

Special tools and machines for mfg. designed and built to order; mechanical and Patent Office drawings. I. A. Weston & Co., Syracuse, N. Y.

A. C. Christensen, 26 Church st., N. Y., mech'l engineer, late chief draftsman at Worthington's. Mechanical and patent drawings of all kinds to order. Patentee of natural gas meters.

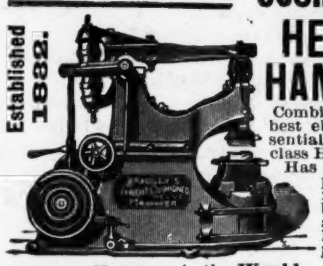
Wanted—One 10 to 15 H.P. horizontal engine; one 15 to 20 H.P. horizontal tubular boiler, complete; 300 ft. 2 in. shafting, with couplings—all second hand, in good condition. Address H. P. Garland, Biddeford, Me.

The large manufacturers of Pittsburgh have as bad water for their boilers as any place on the continent, and find their only remedy in the Petroleum Compound made by Pittsburgh Boiler Scale Resolvent Co., Pittsburgh, Pa. Costs ten cents per week. Write for circular.

BRADLEY'S HEATING FORGES.

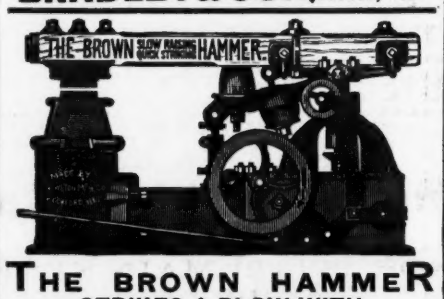
For Hard Coal or Coke. Indispensable in all shops to keep **Bradley's Cushioned Hammers** and men fully employed and reduces cost of production.

BRADLEY'S UPRIGHT CUSHIONED HELVE HAMMER

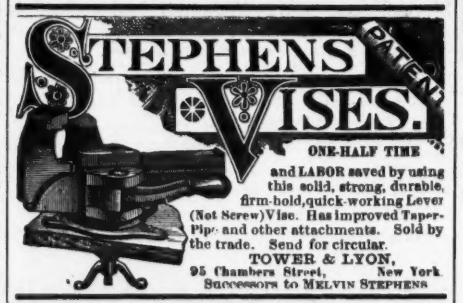


Combines all the best elements essential in a first-class Hammer. Has more good points, does more and better work and costs less for repairs than any other **Hammer** in the **World.**

BRADLEY & CO. Syracuse, N.Y.



THE BROWN HAMMER
STRIKES A BLOW WITH
Double the Velocity That it Raises the Hammer.
A NEW MOVEMENT! SEND FOR DESCRIPTION.
KNOWLTON MFG. CO., KING ST., ROCKFORD, ILL.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PATENT
VISES.
ONE-HALF TIME
and LABOR saved by using this solid, strong, durable, firm-hold, quick-working Lever (Not Screw) Vise. Has improved Taper-Pipe and other attachments. Sold by the trade. Send for circular.
TOWER & LYON,
95 Chambers Street, New York
Successors to MELVIN STEPHENS

STEAM PUMPS for Hot or Cold, Fresh or Salt Water; for Oils, Naphtha, Tar; for Cane Juice, Liquors, Syrups, Scum; for Ammonia, Alkalies, Extracts, Acids; for Thick, Volatile, Viscous or Foul Liquids, etc. VACUUM PUMPS of the highest efficiency. FILTER PRESS PUMPS. Air, Gas and Acid Blowers. AIR COMPRESSORS. Etc. BUILT BY

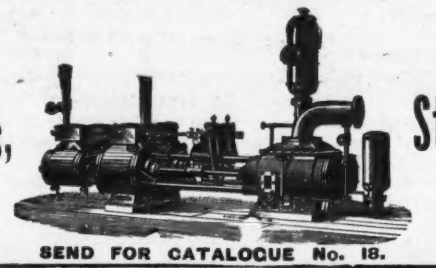
GUILD & GARRISON, Brooklyn, N. Y.

WORCESTER MACHINE SCREW CO.

Manufacturers of Set, Cap and Machine Screws, Studs, etc.

THE DEANE STEAM PUMP CO., Holyoke, Mass.

BUILD Water Works, ENGINES AND Steam Pumping MACHINERY.



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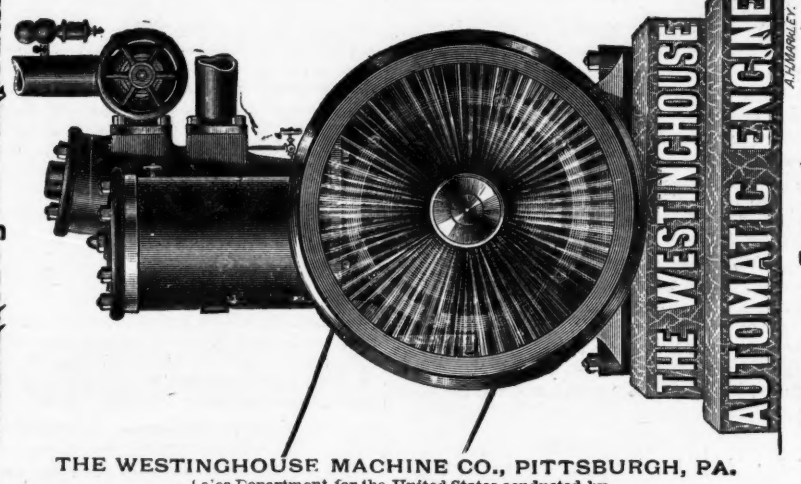
IF YOU WANT A
SHAPER, PLANER, DRILL, LATHE OR SPECIAL MACHINERY,
WRITE TO
THE HENDEY MACHINE CO.,
SEND FOR A CATALOGUE. TORRINGTON, CONN.

THE WESTINGHOUSE AUTOMATIC ENGINE.

Prices Reduced.

Condemned by its Competitors



and Endorsed by its Users.

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Sales Department for the United States conducted by

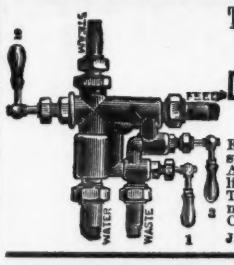
WESTINGHOUSE, CHURCH, KERR & CO.
17 Cortlandt St., N. Y. Hamilton Building, Pittsburgh, Pa.
FAIRBANKS, MORSE & CO., Chicago Ill.
FAIRBANKS & CO., St. Louis Mo.
PARKE & LACY, San Francisco, Cal
UTAH & MONTANA MACHINERY CO., Salt Lake, Utah.
D. A. TOMPKINS & CO., Charlotte, N. C.
IRON BAY MANUFACTURING CO., Marquette, Mich.

THE M. T. DAVIDSON IMPROVED STEAM PUMP,

MANUFACTURED BY DAVIDSON STEAM PUMP COMPANY.

WARRANTED THE BEST PUMP MADE FOR ALL SITUATIONS.

PRINCIPAL OFFICE, No. 77 LIBERTY STREET, N. Y.
NEW ENGLAND OFFICE, 51 OLIVER STREET, BOSTON, MASS.



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Sustained by the U. S. Courts.
—The—
Duplex, Union and Alert
INJECTORS.
Simple in construction. Easily taken apart. No springs to get out of order. Always ready. Always delivers water hot to boiler. Thousands in use and demand increasing. Send for Catalogue, to
JAS. JENKS & CO., Detroit, Mich

Iron and Wood Turning Lathes and Lathe Heads, Emery Grinders, Gear Cutting attachments for Lathes, special Screws, Studs, etc.

PROGRESS ENGINE & MACHINE WORKS,
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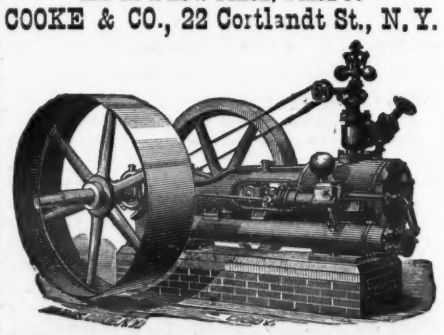

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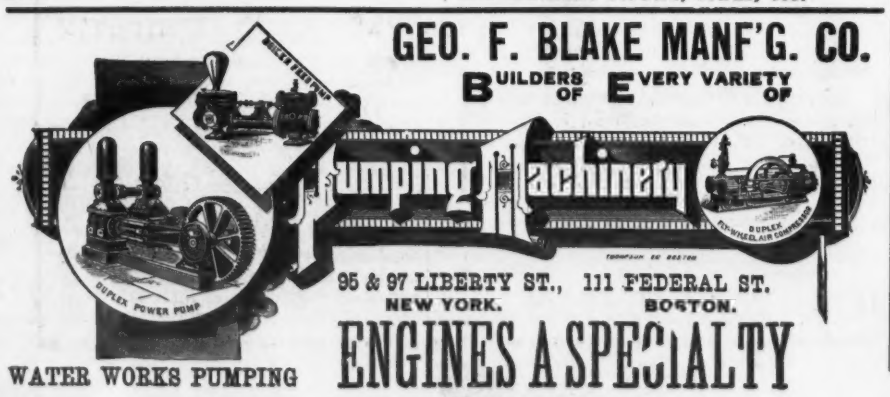

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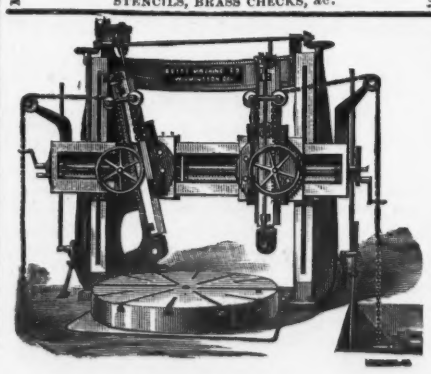

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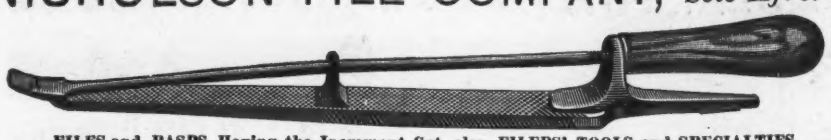

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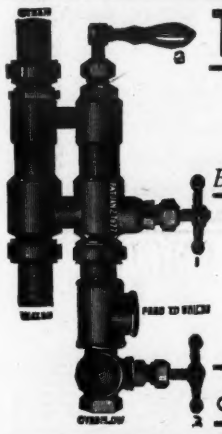

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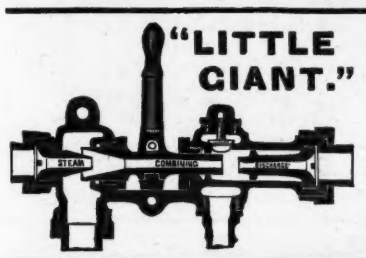

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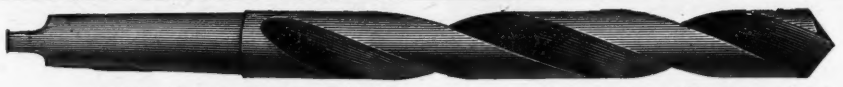

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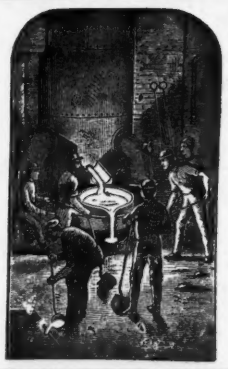

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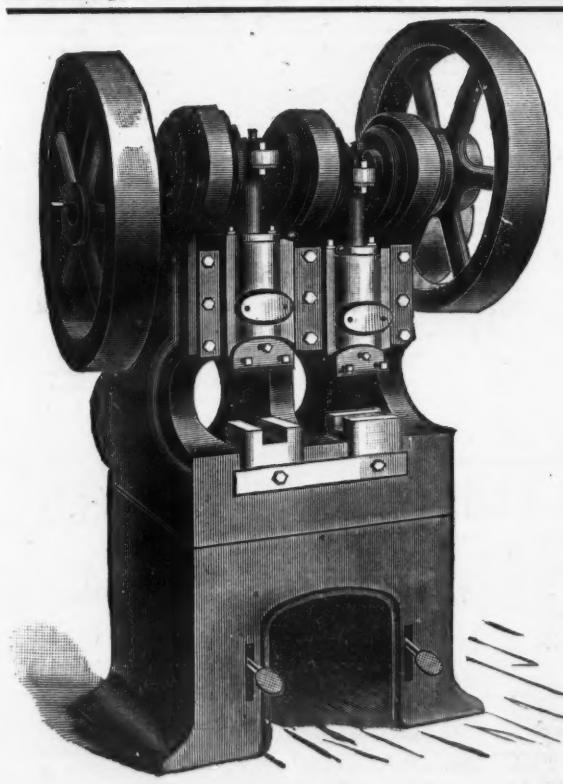

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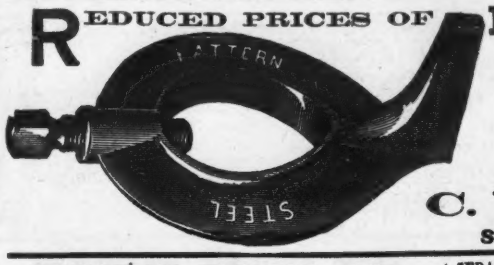

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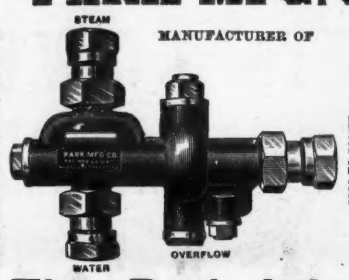

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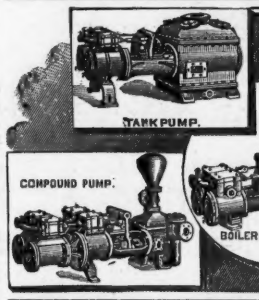

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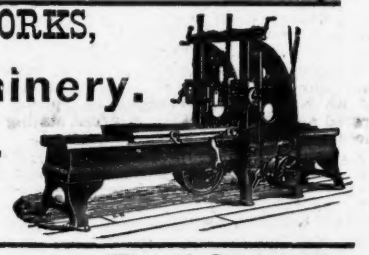

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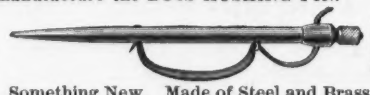

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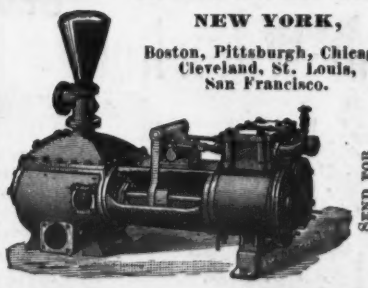

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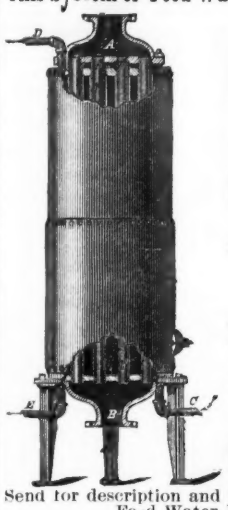

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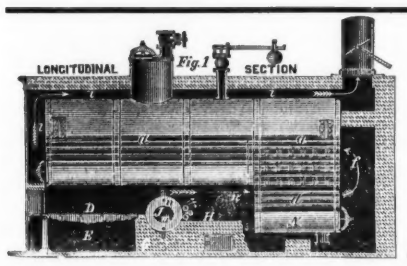

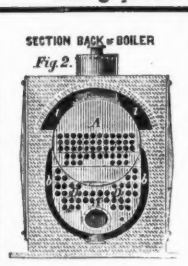

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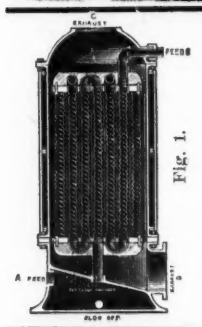

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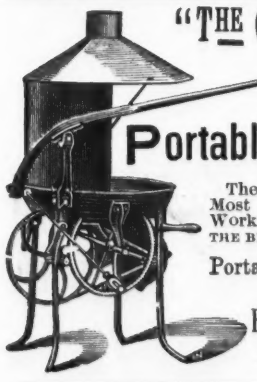

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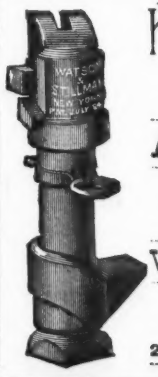

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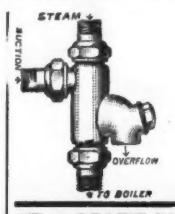

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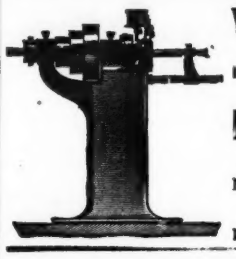

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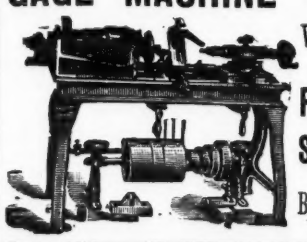

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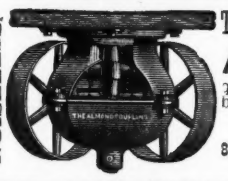

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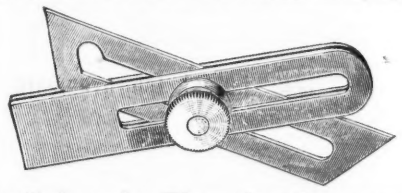

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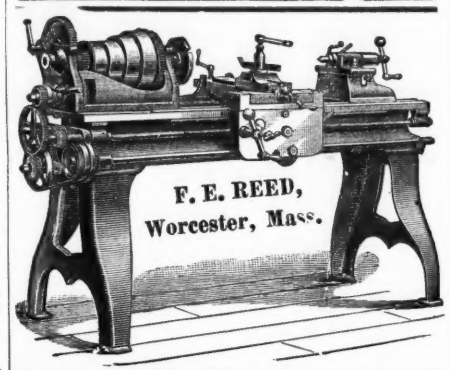

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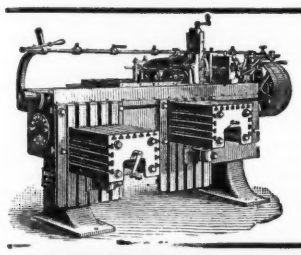

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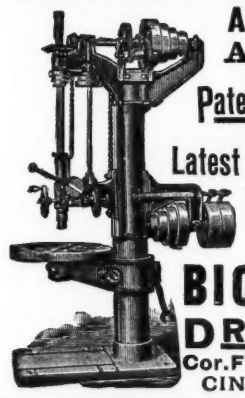

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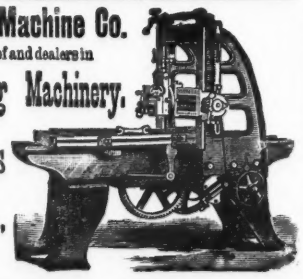

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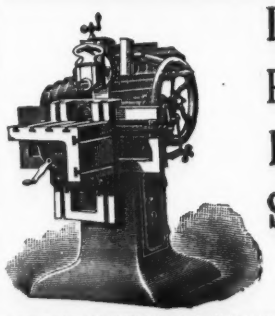

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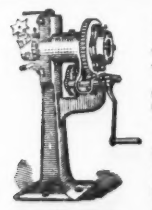

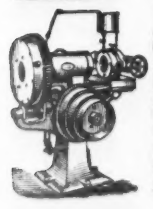

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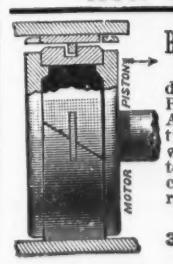

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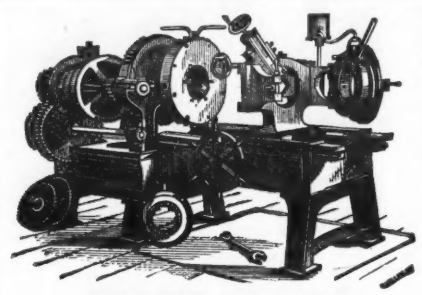

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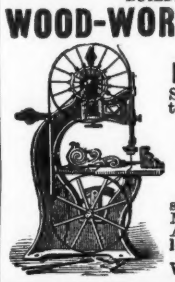

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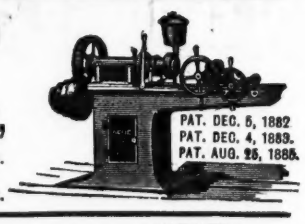

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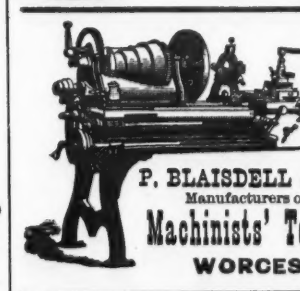

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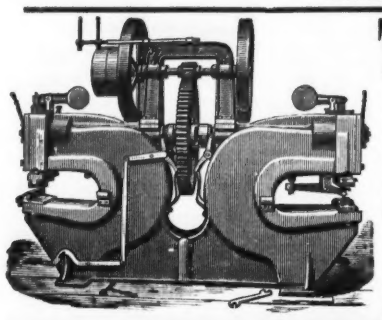

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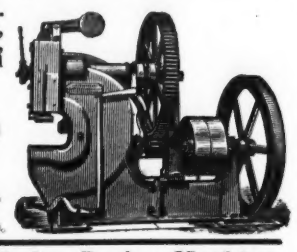

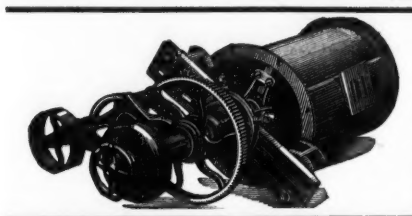

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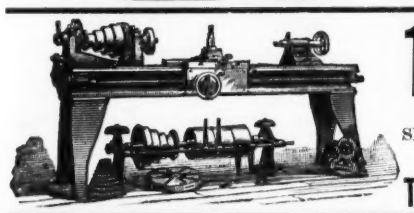

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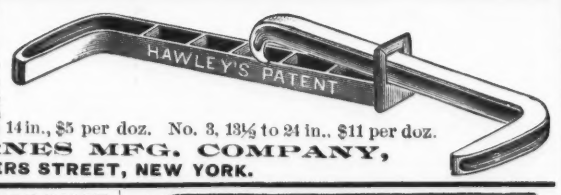

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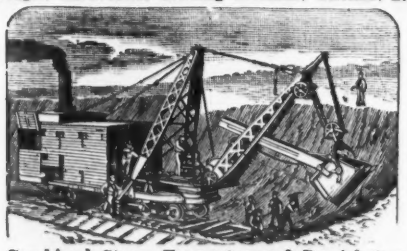

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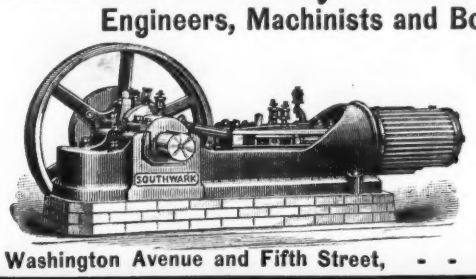

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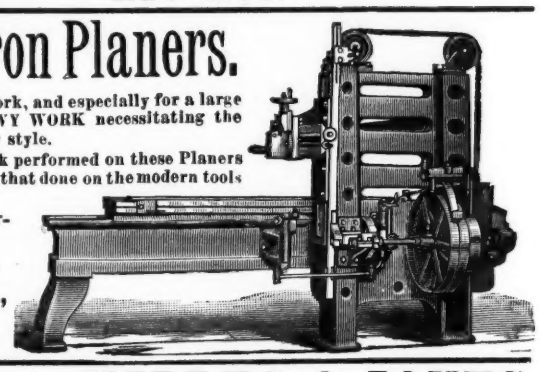

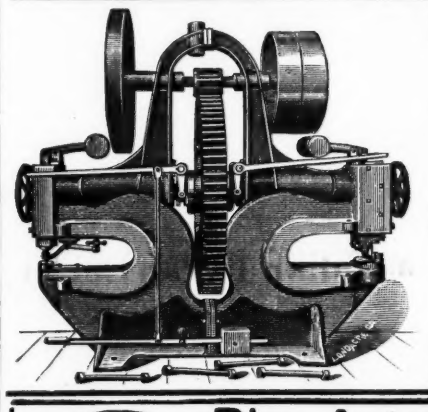

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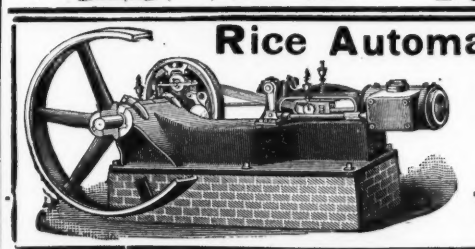

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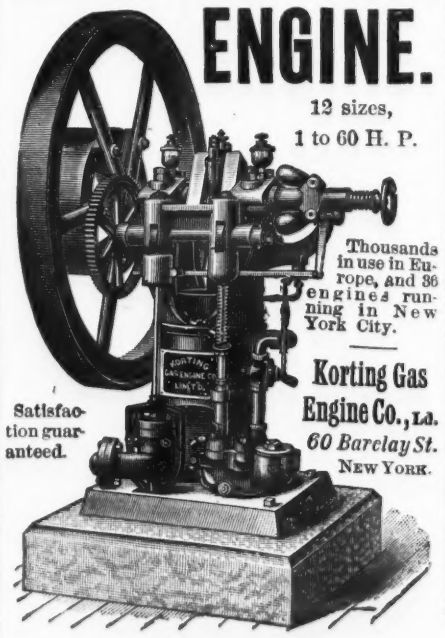

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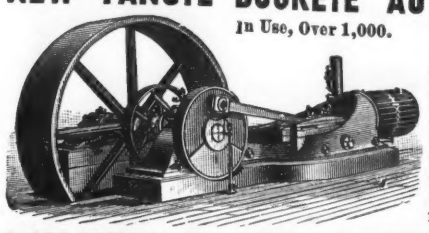

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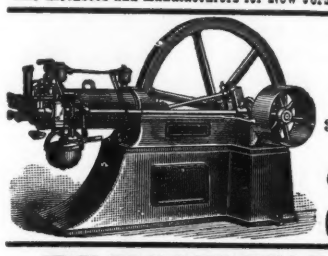

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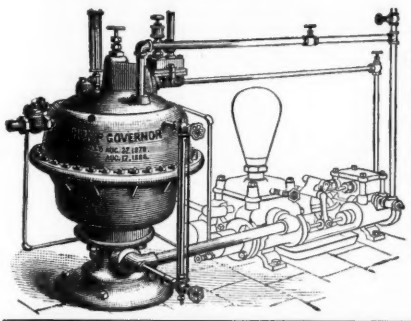

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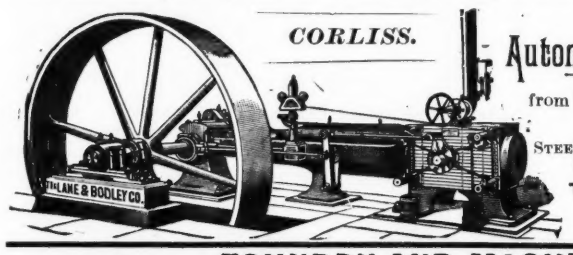

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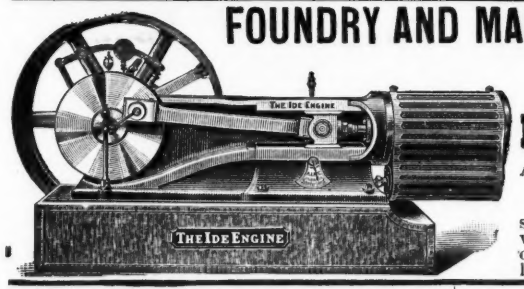

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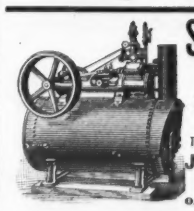

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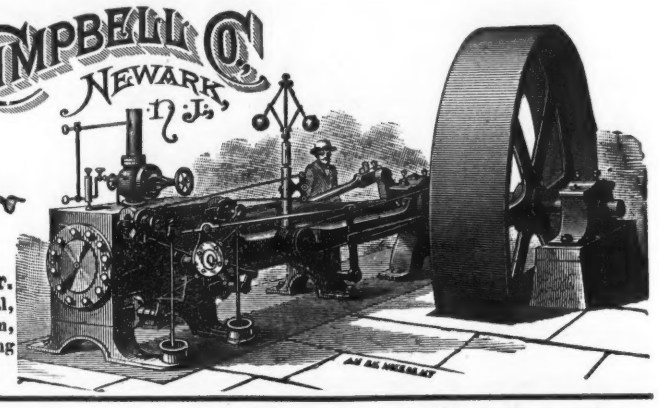

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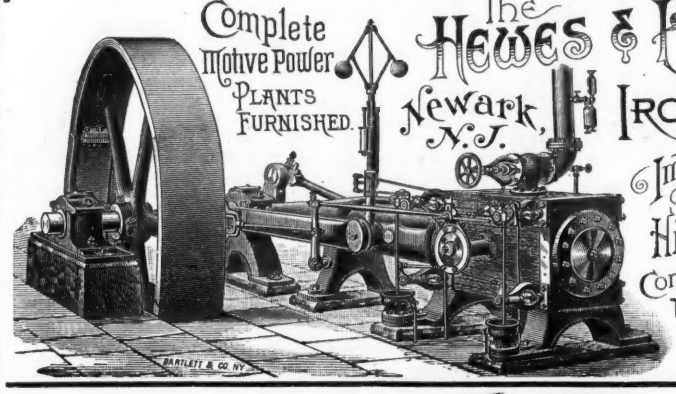

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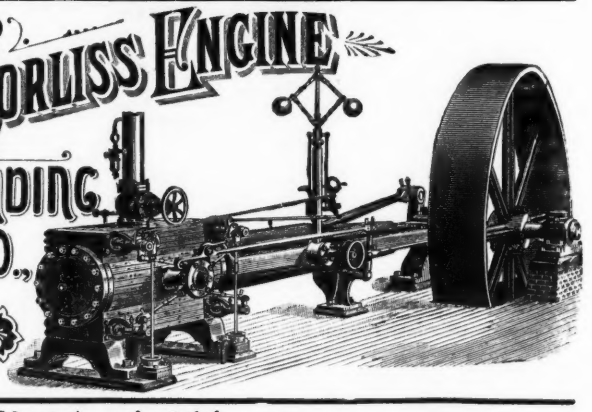

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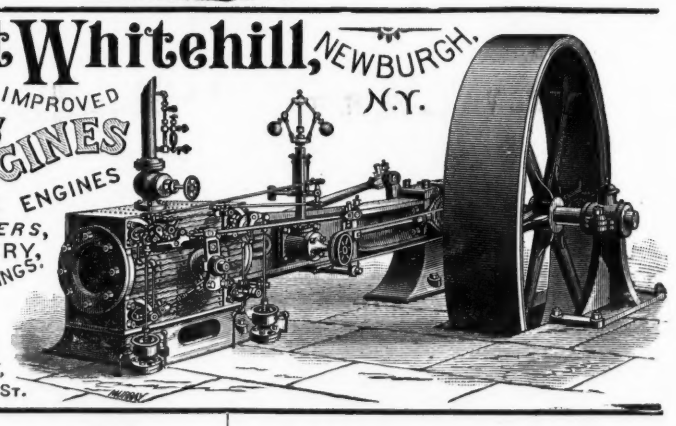

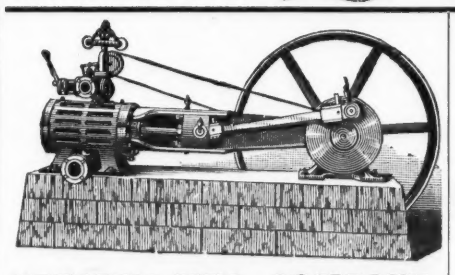

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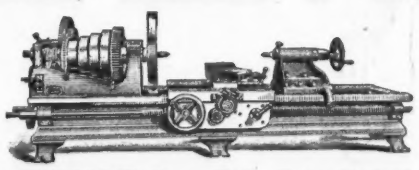

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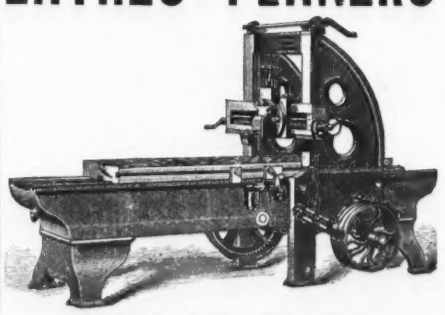

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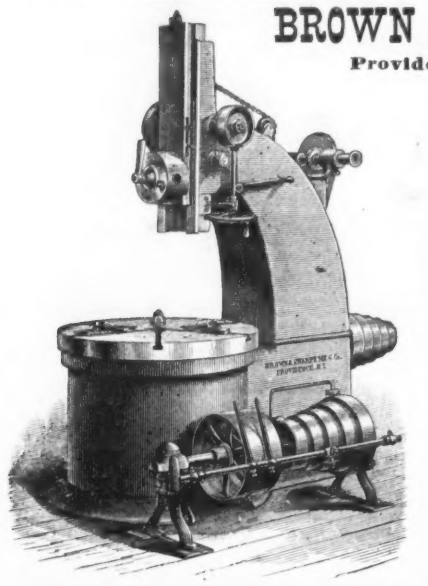

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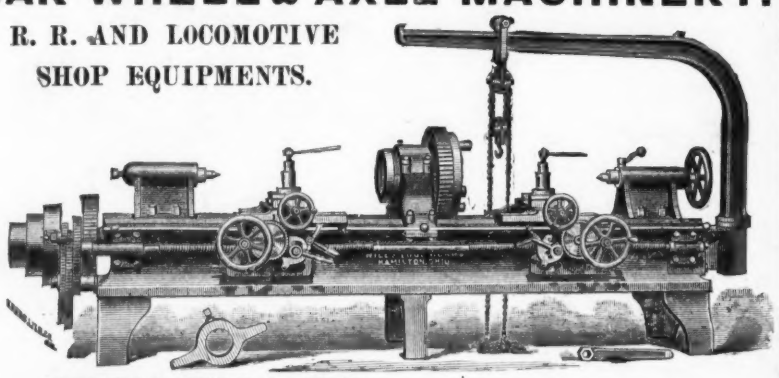

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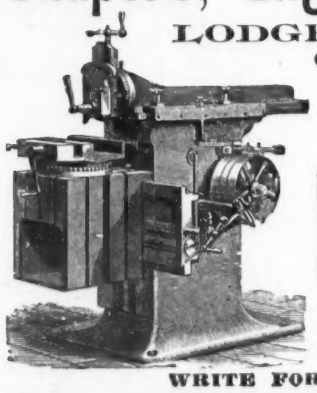

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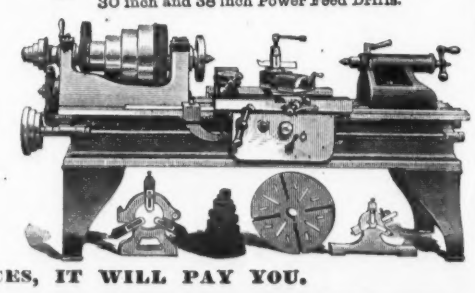

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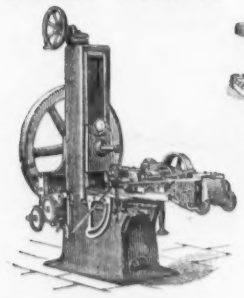

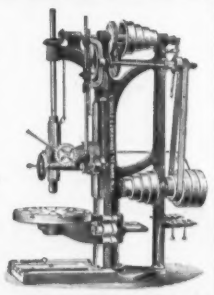

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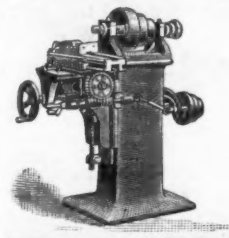

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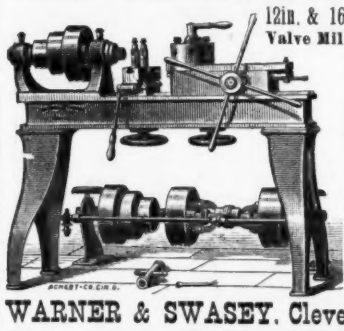

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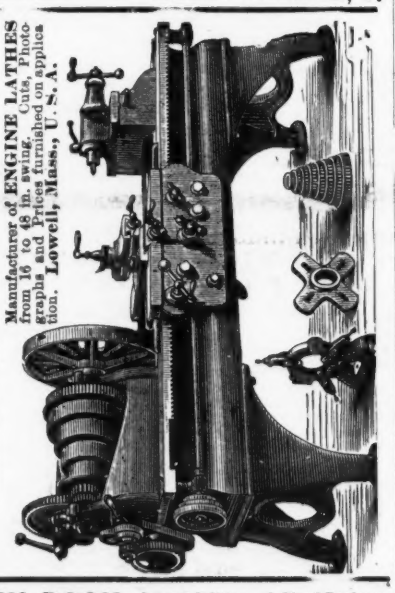

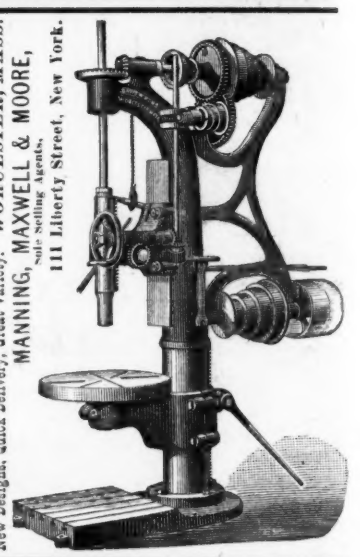

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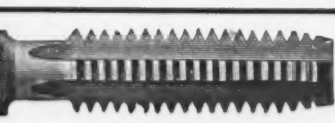

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